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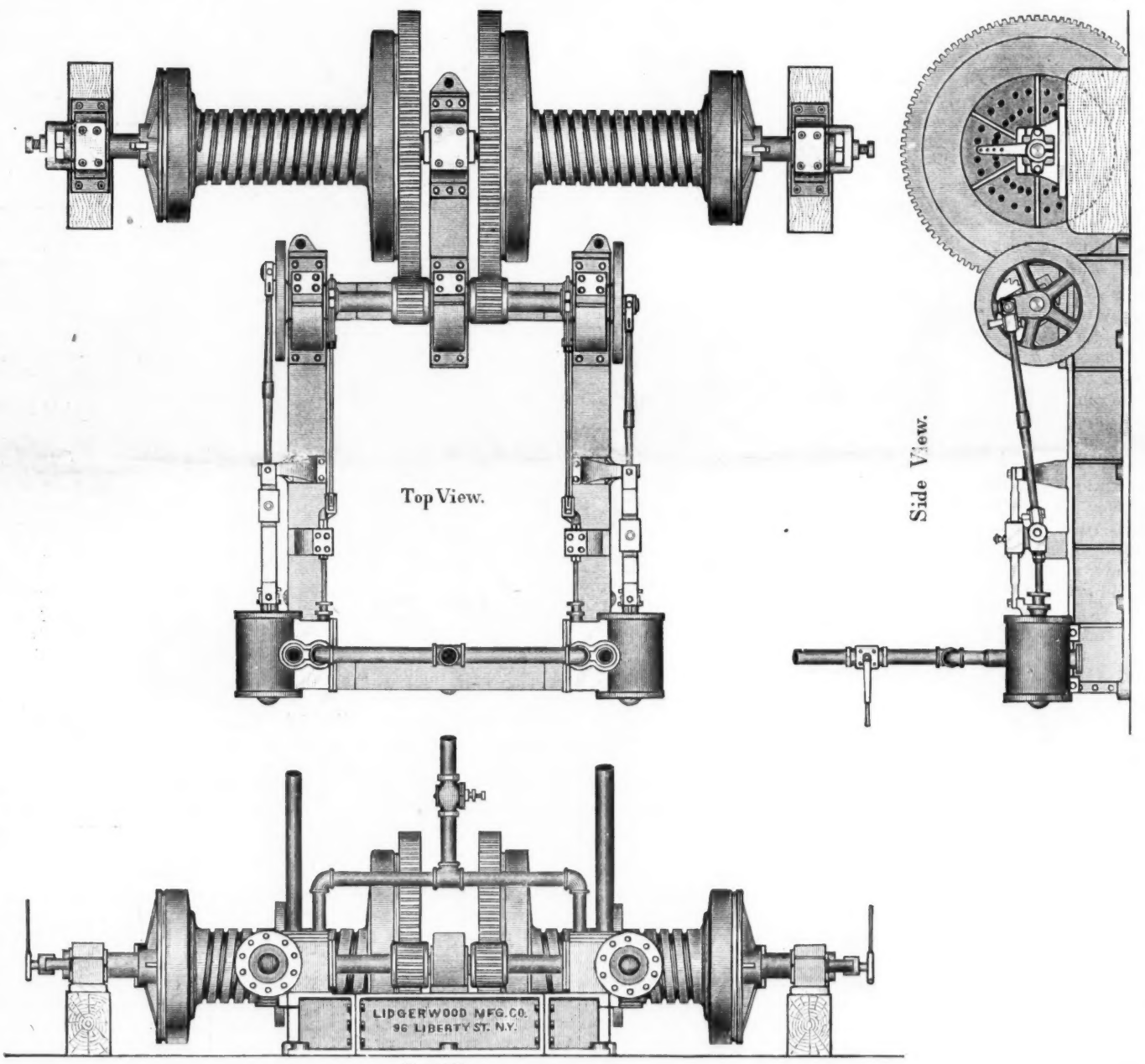
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New Dredging Engines.

We present with this engravings representing a pair of dredge engines, recently built by the Lidgerwood Manufacturing Company, 96 Liberty street, New York, for Ross & Sanford, Jersey City, N. J. They are strong and powerful engines for their class, built for hard and steady duty, which are essential features in engines for such use.

The cylinders are 14″x18″, strongly geared to the drum as shown, the engines being mounted on a hollow bed plate, bolted together to make substantially a continuous bed. As will be noticed, the main shaft carrying the driving pinions is rigidly connected to the inner drum journals; this connection being next to the driving pinions and gears holds the gearing in proper position, avoiding the spreading of centers almost sure to occur when there is no such connection.

The winding drums are scored, and are provided with friction at each end. At the outer ends the wooden friction blocks are made fast to a disk, and at the inner ends to the large spur wheels. This double friction makes a powerful holding arrangement, requiring small motion to engage and disengage. The manner in which the wooden friction blocks are fitted and fastened provides for the ready substitution of new ones at any time when it becomes necessary. All parts of these engines are simply arranged, so as to be little liable to get out of order, and to be kept in proper working condition by any one of ordinary intelligence and experience.



NEW DREDGING MACHINE.

Ample arrangements are made for taking up lost motion, and the unusual length of connecting rods—seven cranks—makes the wear and strain on slides small.

As shown in the engravings the engines are spread sufficiently to permit the boiler to project up through the center space; they can be brought nearer together where some other location of boiler is desirable.

Baltimore & Ohio Railroad.

The bridge over the Schuylkill just below Gray's Ferry, Philadelphia, is being pushed ahead very rapidly. Three of the four caissons have been built; one of them is in place and under pressure. A coffer dam is constructed for the east side of the river.

At the west side, a construction track has been laid to the water's edge, and grading is progressing rapidly. Two large lighters have each been fitted with a battery of three boilers. Two Worthington duplex steam pumps, two air compressors, and a six lamp dynamo, with special engine for the same, will furnish means of sinking the caissons. The water is about 25 feet deep, and it is expected that the central caisson will be sunk about 30 feet below the river bed. A gravel train of 20 cars, drawn by a 15-ton engine, is cutting and grading toward Washington avenue, and two more trains will soon be put on. The work is driven forward night and day, both on bridge and grading.

"Tom" gained a victory over the grindstone the other day. The boys would slop water on the belt, and it would get too tight. The belt soon would get dry, be loose and slip. Tom put trucks under one end of the frame and kept a crowbar handy. It worked well.

Every drill will cut a little larger hole than its own diameter; but if one lip of that drill be longer than its mate, then the hole will have a diameter equal to twice the length of the longest lip.

A correspondent writes to say that the subject of the change of pitch, as of a locomotive whistle when approaching, is fully explained in Ganot's Physics. Those interested in the matter will find formulas in the work referred to.

Oil costs too much to be used in drilling rough holes in wrought iron. Use soap suds or soda water, and apply it with a little squirt gun.

The Machinist who Travels—How John and Henry Started Business.

BY JAMES F. HOBART.

One of the best things a young man can do is to save a little money. No matter if it is only one dollar a week. If that is the best he can do, let him stick to it. Another best thing for a young man to do is for him to take half of that money and go on a tramp. There is nothing else in the whole list of accomplishments which will so help on a man as to look around the country and see how his neighbors do things.

A man can see a good deal of country for $100, and he cannot invest it to any better advantage.

John and Henry learned the "trade" in the same shop. John was wide-awake, go-ahead, and always on the lookout for something new or better. Henry was a fine workman. He could do a job as nice as you please. Those two boys got hold of a little money. They saved part of it, and made up their minds to start business for themselves.

John built a little shop in a town of 4,000 population, while Henry bought out an old concern already long established.

John had everything to build new except the goodwill of his neighbors.

When Henry bought the old shop, he got a small run of custom, a big scrap heap, a hundred old traps and contrivances, and a thousand pieces of prejudice. He went into the old shop, settled down among the old jigs and notions, plodded along without caring whether the world moved or not, and to-day he is plodding still.

If Henry and his shop were wiped out of existence, nobody would miss them or ask where they had gone.

John did not do so. He didn't want any "old-established business." He wanted to begin new, and John was right.

Before John bought a single tool, or drove a nail in that new shop, he packed his grip-

sack and started out to see his neighbors. John was well acquainted with the mechanical world. He had read the papers, and when he saw a new lathe or an improved engine he knew its points without much study.

John went around into lots of the big shops. He saw how they did work, and made notes of their methods. He noticed how they ground drills, how they used them, and how the drills worked. He found shops which never let their men grind even a lathe tool; a certain standard shape was adopted for each tool, and the toolmaker kept up that shape always.

John looked around in little shops as well as in the big ones. Not a jig escaped his eye. He saw them when they were in use, and mentally compared the rigs with others he had seen.

When John got into a big shop which "had got its name up," then John noticed how the conceit was piled on. The big shop had struck certain well-paying ruts, and stuck to them ever since. These shops made him think of Henry. Henry will die some day, and his business will never be missed. The big old shop will die too. It is suffering with a kind of "dry rot," and some day they will wake up to find themselves away behind the times, their business forever lost, and their whole establishment of no earthly use.

John sees all these things as he looks around, and chooses the best machinery for his little shop.

We met John at the Novelties Exhibition last week. He was looking at a big lathe, and we heard him say to himself, "That lathe is a nice one; it will do first-class work; it is just the thing to have in a big shop where you can keep it for certain jobs, but I don't want it in my little shop. I will buy that lathe over there, and it will do all I require."

John's head was level. He has taken the trouble to go around and see things, and is able to take advantage of the best. If Henry wants a lathe, he will bring out one of the ancient patterns which former owners bequeathed to him, and make a lathe in his own shop. John bought a lathe, and made $200 with it while Henry was building something with "two spindles and a bed."

John will start off every year and see what the world is doing, while Henry stays at home and builds old-style throttling engines "just to keep his men busy."

Perhaps John is up in Canada or down in Texas. No matter where he is, we shall hear from him before long. He will make his mark, and a big one, too.

Technical School at Atlanta.

We learn from *The Evening Capitol* that the technical school started at Atlanta last February as an experiment, is to be continued this fall and winter with gratifying prospects of success. The room occupied last spring was too small for the accommodation of all who wished to attend, and several gentlemen of Atlanta have interested themselves in obtaining more suitable rooms. The school will open in October, with Mr. H. T. Roffe as superintendent, assisted by able volunteers. The instructions will be in wood and iron working, and in drawing and designing. Mr. Roffe is a practical mechanic, and superintendent of the Georgia Machinery Co. We believe that he is a graduate of a technical school, and that he has had considerable experience in the operation of schools of this kind. The citizens of Atlanta are to be congratulated on the move they are making. It will exert an important influence on the future mechanical standing of the city.

Modern Locomotive Construction.

By J. G. A. Meyer.

ELEVENTH PAPER.

THREE CONDITIONS A SLIDE VALVE MUST FULFILL.

The entrance of steam into the cylinder is regulated by the two outside edges, *a b* and *c d* of the slide valves, Fig. 34; the exit of the steam is regulated by the two inner edges *e f* and *g h* of the slide valve; and the correct admission and exhaust of the steam depends upon these edges, the motion of the valve, that is, the travel of the valve and the position of the eccentric.

All slide valves must be capable of fulfilling the three following conditions, and if a slide valve cannot do this, the engine will not work satisfactorily:

First Condition.—Steam must be admitted into the cylinder at one of its ends only at one time. To satisfy this condition, the length of the valve from *a* to *c* must at least cover both steam ports, when the valve stands in a central position, as shown in Fig. 34. This length of the valve cannot be less, because if it is made less, steam will enter both ends of the cylinder at one time, and consequently bad results will follow.

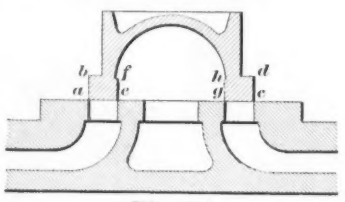


Fig. 34

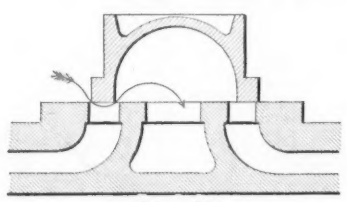


Fig. 35

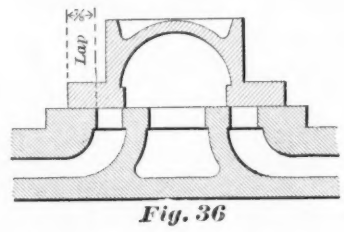


Fig. 36

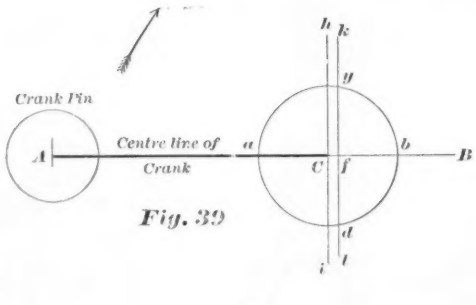


Fig. 39

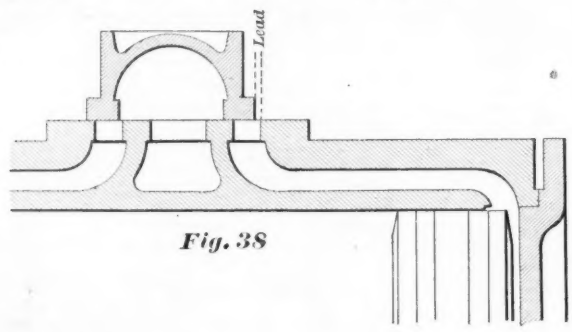


Fig. 38

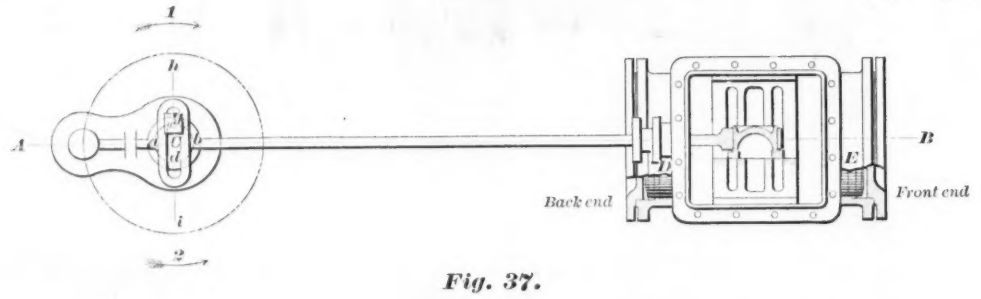


Fig. 37.

Second Condition.—The valve must allow the steam to escape from one end of the cylinder, at least as soon as it is admitted into the other end of the cylinder. To fulfill this second condition, the length of the exhaust cavity in the valve, or, in other words, the distance between the two inner edges *e f* and *g h*, Fig. 34, must be equal to the sum of the widths of the two bridges added to the width of the exhaust port. The length of the exhaust cavity in a valve whose outside edges just cover the steam ports, must not be made less than shown, because if it is made less, steam will be admitted into one end of the cylinder, sometime before the steam in the other end of the cylinder is released, and consequently a considerable amount of back pressure will be the result. When the outer edges of a valve overlap the steam ports, such as shown in Fig. 36, then its exhaust cavity can be made less, within certain limits, and still satisfy the second condition.

Third Condition.—The valve must cover the steam ports so as not to allow the steam to escape from the steam chest into the exhaust port. To fulfill the third condition, the length of the exhaust cavity, that is, the distance between the edges *e* and *g*, Fig. 34, must not be made greater than the sum of the width of the two bridges added to the width of the exhaust port, in a valve whose outside edges just cover the steam ports. If the length of the exhaust cavity in such a valve is made greater, then the distance between the edges *a* and *c*, or the distance between the edges *g* and *c* will be less than the width of steam ports, and consequently the steam will be permitted to pass from the steam chest directly into the exhaust port, as indicated in Fig. 35, or, as the practical man would say, the steam will blow through, and therefore an unpardonable waste of steam would be the result.

If the outside edges of the valve overlap the steam ports, as shown in Fig. 36, then the exhaust cavity can be made within certain limits a little longer, without interfering with the third condition.

For the sake of distinction we may divide slide valves into two classes. In one class we may place all slide valves whose outside edges just cover the steam ports, such as shown in Fig. 34. These valves will admit steam into the cylinder during the whole stroke of the piston, or as the practical man would say "the valve follows full stroke."

In the other class we may place all slide valves whose outer edges overlap the steam ports, such as shown in Fig. 36. These valves will not admit steam into the cylinder during the whole stroke of the piston, but will close the steam ports, and thus cut off the flow of the steam into the cylinder, before the piston has reached the end of a stroke. The position of the piston at the moment that steam is cut off, is called the point of cut-off, and this point depends upon the amount of lap.

When a valve of this kind is placed in a central position, that is, midway of its travel as shown in Fig. 36, then the amount of overlap at each end is called "outside lap," or simply lap. Thus, if as in Fig. 36, the valve overlaps each port $\frac{7}{8}$ of an inch, then the valve is said to have $\frac{7}{8}$ of an inch lap. Under no circumstances should one of the outside edges of the valve be placed flush with an outside edge of the steam port, and then the total amount of overlap at the other end of the valve be called lap, because that would be wrong according to the universal acceptation of the term "lap."

TRAVEL OF THE VALVE.

Since it is always taken for granted that the steam ports are made just large enough—and no more—to give a free exhaust, we must give the valves that have no lap, as shown in Fig. 34, such a travel that the outside edges of these valves will wholly open the steam ports. We cannot make this travel any less, because if it is less the steam port will not be fully open to the action of the exhaust. On the other hand, theoretically, the travel of a valve that has lap need not be such that the steam port will be fully opened to the admission of steam; all that is really needed for this purpose is an opening of $\frac{8}{10}$ of the width of the steam port, and if this does not interfere with the free action of the exhaust, that is, if it does not prevent the full opening of the steam port for the escape of steam, satisfactory results will follow. In practice, such niceness in the travel of the valve is seldom aimed at. In fact, it is customary to assign such a travel to a valve, that the outside edges of the valve will not only fully open the steam ports, but travel a little beyond the steam ports. Adopting such a practice, we gain the following advantages: When a valve that has no lap travels a little further than necessary to fully open the steam port, we have the assurance that a slight inaccuracy in workmanship, which cannot always be prevented, will not interfere with the full opening of the steam port. Again, it is always desirable that when the valve is to cut off steam, it will do so as quickly as possible, hence, when valves that have lap and their travel is greater than absolutely necessary, the motion of these valves will be quicker than the motion of valves with shorter travel; therefore, when the former are employed, the cut-off will be more sharp and decisive.

Ex. 13: To find the travel of a valve that has no lap, the width of the steam port being given, let the steam port be $1\frac{1}{4}$ inch wide. The travel of a valve without lap must at least be equal to twice the width of the steam port. The truth of this must be perceived when we examine Fig. 34, and remember the remarks just made. Consequently, the travel of the valve in our example will be

$1\frac{1}{4} \times 2 = 2\frac{1}{2}'' =$ travel of the valve.

Now, if the travel of the valve is to be such that the valve shall move $\frac{1}{4}$ of an inch beyond the steam port, then we must add this amount to the width of steam port, and make the travel equal to twice this sum. Thus:

Ex. 14. Width of steam port $1\frac{1}{4}$ inch, the valve to travel $\frac{1}{4}$ of an inch beyond the steam port, find the travel.

$$1\tfrac{1}{4} + \tfrac{1}{4} = 1\tfrac{1}{2},$$

and

$1\frac{1}{2} \times 2 = 3$ inches = travel of the valve.

When this valve is used in an engine with no rocker interposed, then the eccentricity of the eccentric, or in other words, the distance between the center, *C*, of the crank shaft and the center, *x*, of the eccentric, Fig. 30, will be $1\frac{1}{2}$ inch, and the throw of the eccentric will be equal to the travel of the valve, namely, 3 inches.

To find the travel of a valve that has lap, the lap and width of the steam port being given:

Ex.: The width of the steam port is $1\frac{1}{4}$ inch, the lap is $\frac{7}{8}$ of an inch, find the travel.

If the valve is to open the steam port fully, and no more, for the admission of steam, then the travel cannot be less than twice the sum of the width of the steam port and lap. Hence in our example we have $1\frac{1}{4} + \frac{7}{8} = 2\frac{1}{8}$ and $2\frac{1}{8} \times 2 = 4\frac{1}{4}$ inches, = travel of the valve. If the valve is to move $\frac{1}{4}$ of an inch beyond the steam port, then we have $1\frac{1}{4} + \frac{1}{4} + \frac{7}{8} = 2\frac{3}{8}$ and $2\frac{3}{8} \times 2 = 4\frac{3}{4}$ inches = travel of the valve. When no rocker is interposed, the throw of the eccentric is equal to the travel, that is $4\frac{3}{4}$ inches.

POSITION OF ECCENTRIC WHEN NO ROCKER IS USED.

Assume that a valve without lap is to be used in an engine similar to that shown in Fig. 37, that is, an engine in which the axis of the cylinder will pass through the center of the crank shaft; also let it be required

that at the precise moment that the piston reaches the end of a stroke, the valve shall open the steam port. In Fig. 37, it will be noticed, that instead of showing the back of the slide-valve as it should be, we have assumed the valve and seat to be turned around the valve stem, so as to see a section of the valve and seat; this will make the illustration more intelligible for our purpose. Now, assume that the piston stands at *D*, the back end of the stroke, then the crank will be in the position as shown, and according to our proposition, the valve must at that instant open the back steam port, consequently the valve must stand in the position as indicated in the figure. Again, assume that the piston stands at *E*, the front end of the stroke, then the valve must stand in a position so that the least movement will open the front steam port, consequently the valve will occupy the same position as before. In fact, when the piston stands at either end of the stroke, the valve having no lap, must stand in a central position, that is, midway of its travel. To find the suitable position of the eccentric when this valve stands central, we proceed as follows:

From the center *C*, describe a circle *a*, *b*, *d*, (Fig. 37), whose diameter is equal to the travel of the valve; the circumference of this circle will represent the path of the center of the eccentric, or, what amounts to the same thing, the path of the center of the pin *y*, and consequently the exact location of the center of this pin must be found somewhere in the circumference *a*, *b*, *d*. Now, the diameter *a*, *b*, is equal to the travel of the valve, hence we may assume that the point *a* will represent one end, and the point *b* the other end of the travel, and *C* the center of the travel.

Since the valve must stand midway of its travel when the piston stands at one end of its stroke; or, in other words, when the crank is in the position as shown, we conclude that, at the commencement of a stroke, the center line *i*, *h*, must pass through the point *C*. Therefore to find the location of the pin *y*, draw through the center *C*, a line *i h*, perpendicular to the line *A*, *B*; the line *i*, *h* will intersect the circumference *a*, *b*, *d*, in the points *g* and *d*. If the crank-pin is to turn in the direction of the arrow marked 1, then the point *y* will be the center of the pin or the center of the eccentric; if the crank is to turn in an opposite direction, as indicated by arrow 2, then the point *d* will be the location of the pin *y*.

From the foregoing we learn that the center of the eccentric, or the pin *y*, will always travel ahead of the crank in either direction, providing no rocker is used, Secondly, we learn that for a valve without lap the center of the eccentric will be found in a line drawn perpendicular to a line passing through the center of crank-pin and the center of crank-shaft, providing the valve has no lead.

The straight line drawn through the center of crank-shaft and center of crank-pin will, in the future, be called "*the center line of crank.*"

By "lead" is meant the width of the opening of the steam-port at the commencement of the stroke of the piston. Thus, in Fig. 38, when the piston stands at the beginning of the stroke, and the valve has then opened the steam-port $\frac{1}{16}$ of an inch, that $\frac{1}{16}$ of an inch of opening is called "lead," and the valve is said to have $\frac{1}{16}$ of an inch lead. Again, if the valve has opened the steam-port $\frac{1}{8}$ of an inch, instead of $\frac{1}{16}$ of an inch, the valve is said to have $\frac{1}{8}$ of an inch lead. In our previous example the valve had no lead, therefore the question arises, where shall we place the eccentric when the valve has lead?

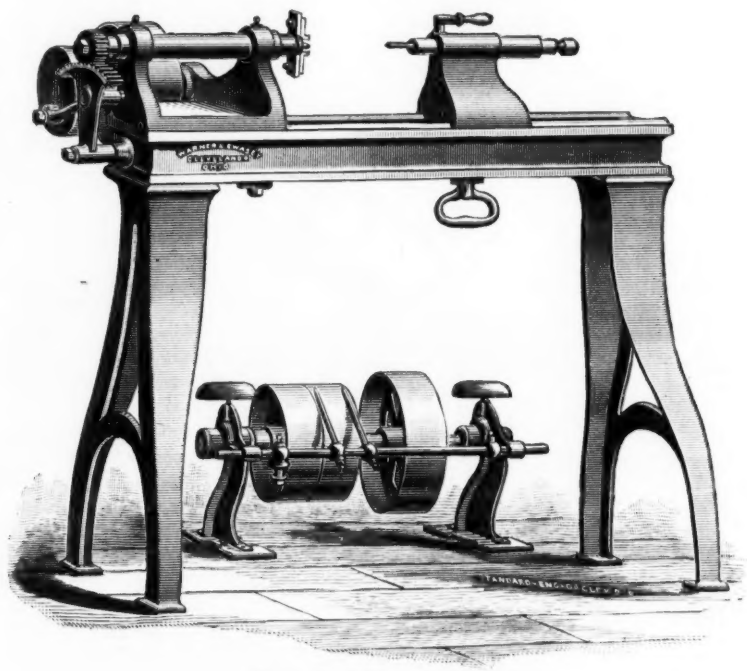
Example 15—Let *A B*, in Fig. 39, represent the center line of crank; the direction in which the crank is to move is indicated by the arrow. The lead is to be $\frac{1}{16}$ of an inch, the travel of the valve 5 inches; find the position of the eccentric. From the center *C*, draw a circle *a*, *b*, *d*, whose diameter is equal to the travel of the valve, namely, 5 inches, on the line *A*, *B*; lay off a point *f*, $\frac{1}{16}$ of an inch from the center *C*; through the point *f*, draw a line *k*, *l*, perpendicular to the line *A*, *B*, this line *k*, *l*, will intersect the circumference *a*, *b*, *d*, in the points *y* and *d*; the point *y*, will be the center of the eccentric. If the crank had been designed to move in the opposite direction, then the point *d* would have been the center of the eccentric. If no lead had been required, then the center of the eccentric would have been found in the line *i*, *h*, drawn through the center *C*.

From this we learn that when the valve is to have lead the center of the eccentric must be moved forward of the line *i*, *h*, and the amount that the center of the eccentric must be moved forward (or away from the crank-pin) is equal to the lead.

Cock Grinding Machine.

Warner & Swasey, of Cleveland, Ohio, have introduced a new machine for grinding together the keys and bodies of brass cocks. The accompanying cut shows the details so plainly that but little description is necessary.

It is designed to grind from $\frac{1}{4}$" to 3" cocks. The spindle is actuated by a segmental gear, which causes it to reverse its motion, after making one and one-quarter revolutions, thus avoiding the annoying rings which are developed when the grinding is done in an ordinary lathe.



Cock Grinding Machine.

The machine is supplied with a chuck, which clasps the square of the key to be ground. The foot-spindle slides to its place, and is clamped by the handle shown in the cut. All bearings are so protected that no emery can get to them.

These tools, we hear, are giving the best satisfaction, as the product turned out is much larger and better than by the old methods.

Compound Engine Trials.

The current number of the *Journal of the Franklin Institute* contains an article from Chief-Engineer Isherwood, U. S. N., giving an account of the experiments made with compound condensing engines in Alsace, Germany. The engine is of the portable type, being secured upon the top of the boiler. The cylinders, two in number, are 11.2 inches and 18.9 inches diameter; stroke of both pistons, 18.9 inches. The small, or high-pressure, cylinder is provided with a supplementary cut-off valve, controlled by the governor. The valve of the large, or low-pressure, cylinder has no cut-off except by the lap of the valve. In the experiments the steam was cut off in the small cylinder at .42 of the stroke, and in the large cylinder at .45. Release took place in the small cylinder at .98 of the stroke, and in the large cylinder at .91. In the small cylinder the exhaust closed at .925 of the return stroke, and in the large cylinder at .75. The steam pressure was about 92 pounds by gauge. Both cylinders were partially steam-jacketed, and worked at a piston speed of about 300 feet.

The mean of these trials gave an indicated horse-power for 17.1 pounds of feed-water per hour. In these experiments the steam was expanded about $6\frac{1}{4}$ times; with steam expanded a little more than $9\frac{1}{2}$ times, the consumption of water was a little less than 17 pounds. Practically there was no gain in the higher grade of expansion, as compared with the lower.

The experiments showed that with the lesser grade of expansion nearly 25 per cent. of the steam that entered the small cylinder was in the state of water when cut-off took place; at the end of the stroke this had been reduced by re-evaporation to a little more than $6\frac{1}{2}$ per cent. At the higher grade of expansion 43.8 per cent. of the steam entering the small cylinder was condensed at the time of cut-off, and re-evaporation reduced this to 16.6 per cent. at the end of the stroke.

Notes of the Novelties Exhibition.

The Thomson-Houston electric light have a plant consisting of two 30-light dynamos, and one 25-light machine. They are connected with eighty-five 200-candle-power lamps. This exhibit was suffering from lack of sufficient speed owing to insufficient boiler capacity. The Brush Company showed a few lights, but together with the McTighe system, who have a 36-light plant, were compelled to hold up until the big Houston boiler is steamed up, which will be ready for the second week of the exhibition.

A balanced slide valve by Deal, Courtney & Frankenfield, attracts much attention. It is attached to one side of a model locomotive. With the point of a pencil, the valve can be raised from its seat by means of a connection for that purpose. The engine stops immediately, showing that the valve is almost perfectly balanced.

The Glenmore Iron Foundry shows their grate bar, and also a grate which had seen eleven months' service under an oil still, and is as straight as when first put in place.

A large number of bicycles, exhibited by H. B. Hart, 11 Arch street, Philadelphia, attract much attention. A "home trainer" is shown whereby the art of riding can be practiced at home. They also show a card of 35 drop forgings, illustrating how indispensable this art is to the bicycle manufacturer.

A fine exhibit by the Phœnix Iron Company, Trenton, N. J., contains a 150 horse-power automatic engine 15"×24", and a small engine with two 5"×5" single-acting cylinders, developing about 8 horse-power, with 80 lbs. steam.

John Evans, of Philadelphia, displays three good-looking upright drill presses. One, the largest, has an angle face plate, which can be adjusted to almost any position.

The Davey Safety Engine Co. shows what its engine can do, and refers to the American Machinist, No. 23, Vol. 8.

An exhibit by the Philadelphia Shafting Works, shows their transmitting devices, and also the adjustable loose pulley arrangement, whereby the loose pulley stands still with the belt upon it, instead of being driven by the belt, while the machine is at rest.

A great favorite among visitors, is the Little Giant testing machine by Tinius Olsen & Company, Philadelphia; a portable hand hoist by the same firm, shows a good tool.

A splendid display of machinist's tools by Wm. P. Walter's Sons, Philadelphia, Pa., takes the eye of every machinist who sees them. "I didn't know there were so many tools," said one mechanic in our hearing.

The Webster Water Motor shows a new and powerful application of an old English device. It seems well adapted for driving small machinery.

McMillan's combination vise and lathe, will prove a useful tool for small shops, and for home use. It is an honest tool, and will do drilling up to $\frac{1}{2}$" in good shape. A slide rest, with hand cross feed, and power screw feed obtained by differential gears, moves the slide rest; by removing two pins the lathe may be used as a first class bench vise.

The Chambers brick machine attracts much attention. It makes small brick upon the spot, and illustrates the method finely.

The new Crandall type writer possesses many valuable features. It uses but 28 keys, and prints 84 characters. Type can be changed at will of operator, and instantly. The writing is in plain sight at all times, and never gets out of alignment.

A display of small Edison lamps, and other electrical goods is attracting much attention. Lamps from $\frac{1}{2}$ to 6 candle-power, and small batteries.

The New Disque Leclanche Battery and Fleishmann's electric bell outfits are worthy of attention.

The Mills Button Hole Attachment Company, of Camden, N. J., display an article which will make glad the heart of many a woman. By its use button holes can be made complete and perfect in five seconds. It is entirely automatic, and requires no attendance beyond placing the cloth, starting and stopping of machine.

Burnham's automatic engine is shown, driving 25 sixteen candle-power Edison lamps, and illuminating a Christmas tree in the Eastern part of the building.

The 20×48 Corliss engine of 200 horse-power attracts much attention.

The slag resulting from the smelting of gold and silver ores at Argo is now being returned to Denver in the shape of a beautiful table ware. The colors are a sort of spray of onyx and opal flushed in waves throughout the ware.

The glassworks, where it is made, say they have direct control over these colors, the slag containing a larger per cent. of material necessary than can be found in slag elsewhere. It is melted at a point of intense heat, then poured into vats of agitated water, then remelted and poured into moulds, after or together with an acid mixture, which causes the metal to flux pretty generally with added materials.

The result is a metallic glass with the strength of light cast iron, and in any form of tableware, bowls, cups, tumblers, etc., etc., with the most beautiful sprays of onyx stone colors upon a general background of opal.

Manufacturers will soon divine the secret of this manufacture, which can be also used in the thousand and one forms of building ornament, beside the attractive merchandise already described.—*Denver Journal of Commerce.*

We note that several exchanges congratulate themselves on the assumed fact that the saw-mill boiler is not keeping up its credit as the great exploder. We do not believe this is true. From the last list of boiler explosions reported by the *Locomotive* we notice that two out of twelve were of saw-mill boilers; we think they may be depended upon to maintain their record.

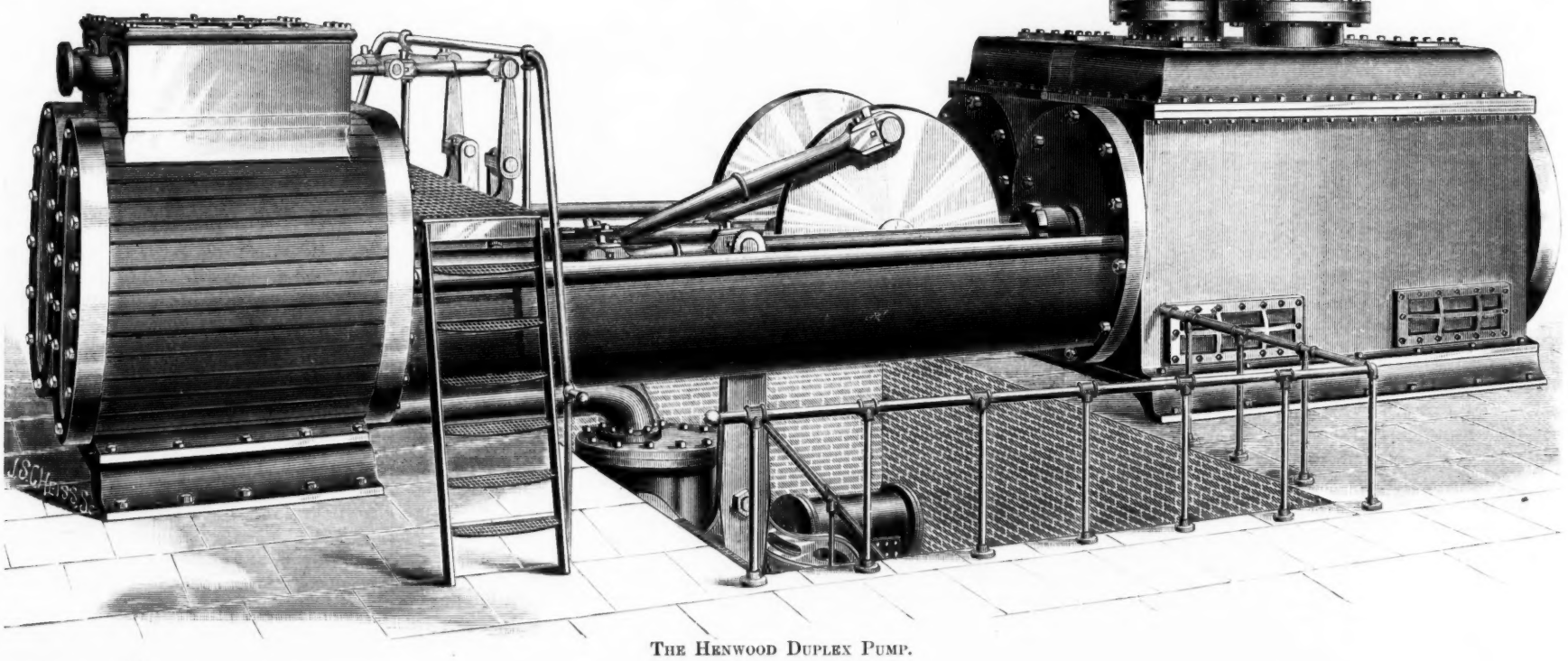
The Henwood Duplex Pump.

The Henwood duplex pump, manufactured by Henwood, Whittaker & Co., Philadelphia, Pa., is made with the plain slide-valve in the steam end, and the compensating packing arrangement in the water end.

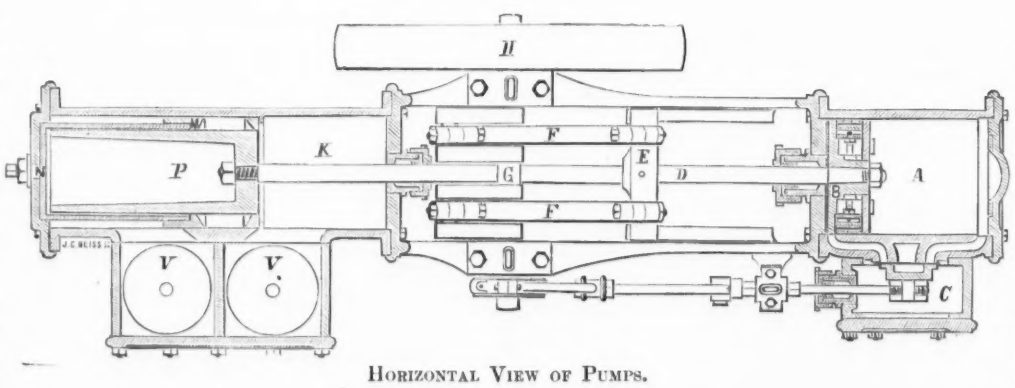
These pumps were designed especially to overcome the faults and simplify the construction of pumping machinery in present use. For all cases where dirty or gritty water is pumped, they are particularly adapted. By the packing arrangement about the plungers, fluid containing as high as 20 to 30 per cent. of sand or grit may be pumped without injury to the cylinders. The plunger has no metallic contact, but works through hemp or elastic packing in the internal stuffing-box. Fastened to the junk ring is a wrought-iron stem, passing through the back cylinder head and ending in a square. After loosening the lock-nut, a wrench may be applied, the junk ring be turned, and the cage forced forward, compressing the packing equally about the plunger. In this way the packing may be "set up" whenever necessary without stopping, as it is done on the outside of the pump. The packing lasts from two to six months, according to the character of the water, amount of grit, etc. Where the water is very gritty, rubber packing is used. To repack requires several rings of hemp or rubber packing, and about ten minutes' time. In a number of tests made, the pump is said to have discharged from 25 to 35 per cent. of river sand.

The steam end is provided with the plain slide-valve, made with the necessary lap to expand the steam from 15 to 40 per cent., so that the advantages of compound pumps are secured without sacrificing simplicity or increasing the cost of the pump. The slide-valve is worked by a lever and eccentric, which has one-half the throw of the valve. The engines are geared at right angles, thus overcoming all trouble of dead centers, and the pump will go to work whenever steam is admitted to it. Being a crank pump, it has a positive motion and positive length of stroke through all variations of speed. It can be run at as high rate of speed as a single pump, which makes it of great value in hydraulic pumping where speed is an object.

In the horizontal view, *A* is the steam cylinder; *B*, the piston; *D*, direct rod from piston to plunger; *E*, crosshead; *F F*, connecting rods; *G*, turn-crank working above the piston and plunger-rod; *H*, fly-wheel; *K*, water cylinder; *M*, junk ring; *N*, cage by which the packing is set up, extending through the back cylinder head and in a wrought-iron stem, secured by lock nut on the outside, and at the other end screwing in the junk ring *M*, whereby the packing may be compressed about the plunger, *D*; *V*, the rubber valves.



The Henwood Duplex Pump.



Horizontal View of Pumps.

The Training of Engineers.

The following, which we take from the *Mechanical World*, contains a good deal of common sense, which we commend to our readers:

A correspondent, the son of a manufacturing engineer, writes: "I am at present learning the practical part of my father's business. I have had a good education, and have a knowledge of mechanical drawing, and I keep the books, etc., and manage the general correspondence of my father's works. I have already worked two or three years at the practical part of the trade. . . . This is a small town without such advantages as are possessed by large towns." etc. He then asks our advice as to what he should do to get along. This, of course, it is very difficult to give so as to do good. Here is a young man who has the inestimable advantages of a father established in business, and for whom he works. The son has, of course, every opportunity of learning all that there is to be learned of his father's business, including, what to many apprentices would be a priceless boon—a knowledge of prices and estimates. The monetary part of the engineer's business is not easily picked up. Few engineers would care, and we cannot blame them for it, for any young fellow to have the run of their costing books and ledgers, and not one apprentice in a hundred, we should imagine, obtains the knowledge in addition to the permission to walk about the workshops for two or three years, with the option of working if he thinks fit. The present writer never could obtain a knowledge of estimating cost until called upon to tender for actual work in a distant colony. The learning and practice of the art were with him coincident, and his advice to the present inquirer is, certainly obtain this knowledge. Further, this young man should make himself a good workman at his father's little foundry, such a workman that he can present himself at the doors of any engineering works and ask for a job as fitter, patternmaker or moulder. His education in a small shop ought to be no bar to this, for often the best and most ingenious men do not come from the larger establishments, where every job is done upon a proper tool, but from the little shop where keyways are cut by hand, not slotted; where cylinders are bored in the shafting lathe and fly-wheels put together by chipping and filing. No fear, then, need be felt by the apprentice who has really worked in a small shop.

Granted, then, that our inquirer is a workman, and has kept the shop hours also at his own place; let him work for six or eight months at some works in a strange town, finding his own value unsupported by a father at his back. Let him choose several works in which thus to improve himself and obtain a knowledge of modern shop practice. He cannot fail in that time to gain knowledge of great value. He should carry in his memory the time required to perform certain work. This he can do without infringing on his employer's time, and he should note this afterwards in his own time. He must stick closely to his work, as the better he serves his employers' interests, the more will he improve himself. If at the end of two or three years of such a "journeyman's" life he has not dropped into some billet which will suit him better than his father's place, he may return home and put into practice his hardly-acquired knowledge, and though he may only be in a small town, we see no reason why he need not have a large workshop in the course of a few years. The size of a town has not much effect on the size of an enterprising works, or why, for example, do we see the Britannia Works in such a place as Gainsborough? All engineering apprentices cannot succeed in life as engineers. Some we have known who have started with every advantage of education, money, and ability to work, who, in fact, did work—have missed their way through fast living and an indulgence in drink. Others again have found themselves unsuited to the occupation. Some of our early acquaintances are amongst the too few shining lights in their profession, but we cannot just now recollect any one amongst our early co-workers who, with a moderate amount of ability and a liking for the profession combined with hard work, has not made a success; moderate it may be in some cases, but still a success. We are, of course, aware that men of six languages are seeking situations, and would jump at a salary less than 40s. per week; but is it not possible that, in the majority, of these cases, there is some other cause of failure?

The Belgian Government, which owns the railroads, has 1,740 locomotives.

English papers record a recent instance of the breaking loose of the rear cars of an excursion train, which were promptly stopped by the Westinghouse brake. This is getting to be a common occurrence in that part of the world.

LETTERS FROM PRACTICAL MEN.

Size-Retaining Boring Tool.

Editor American Machinist:

Where I am employed we have a special piece of casting which we bored with a boring bar and cutter, and there being a great deal of this boring to do, I experienced much trouble in keeping the cutters to size, and it was on this work and worry that a device suggested itself to me, by which this trouble could all be overcome, the plan of which I send you.

In the engraving, Fig. 1 shows an elevation, and Fig. 2 an end view of this boring head, with cutters intact. *A* is the head mounted on a bar *C*, having a tapered hole to insure perfect truth of the head in removing and replacing other size heads on the same bar. A key should be set in the bar on this taper to insure no slipping of the head. *F* represents a nut to draw the head tightly on the taper, while the nut *E* is used to remove the same from the bar without the use of the hammer or other harsh means likely to do damage. *B, B* are the cutters, of cylindrical form, with a threaded shank which screw into the head. *D, D* are set screws with left-hand thread, or rather a contrary thread to the one on the cutter shanks; this is done to prevent the cutters from turning in the head. The broken lines *a a* represent the inside of a hole that this cutter is supposed to be boring. The cutters *B B* are chambered out on the end to the depth of the pitch of the thread on the shanks; at *b* they are milled in with a cutter on their face, from the periphery into this chamber, which forms the cutting edge; they are also cut across their periphery as shown. The face or end of these cutters is cut spiral, having the exact pitch of the screw on the shank of the cutter, thus affording ample clearance on bottom or end of cutter. The clearance on the periphery or edge of cutter is due to the cutter being cylindrical; the corner is beveled, which is also in a spiral.

Now it is clear that the cutter has a proper clearance for cutting, and as it wears it is simply ground on the face of cutting edge at *b*, and the cutter set around on an exact line with the center of the cutter itself and the center of the boring head, rather a little late than in advance, but works well when exactly in line. It will further be seen that the cutting edge, owing to the spiral face on cutter, of the exact time or pitch of screw on its shank always retains the cutting edge exactly the same distance from the head when it is on an exact line across centers, consequently both cutters being a like distance from the start, always remain alike no matter what turns up. Should one cutter have a large piece broken off, by grinding it up to an edge again, and setting on line, the cutter has a proper advance.

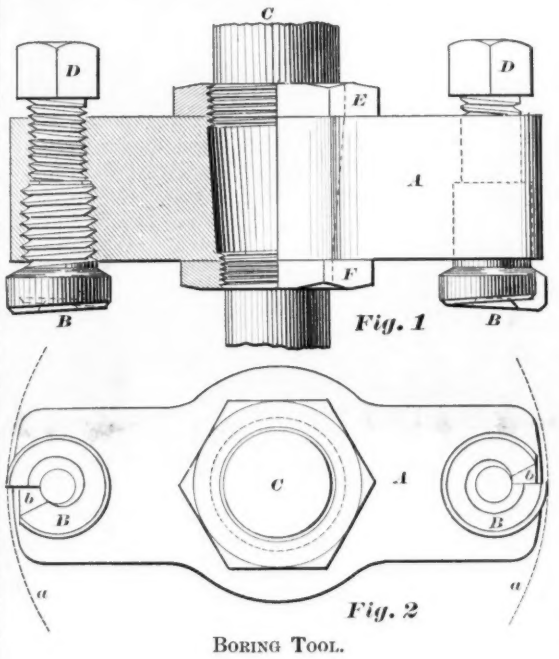
Another feature of merit is that these cutters can be ground to almost their whole circumference before they are actually worn out, which will give long service.

I have no doubt some of your readers will suppose (at first sight) this to be an expensive tool to make, and very difficult to get correct; but this is not the case when taking the proper plan for doing it. The plan is as follows: First, bore out the head, face it on the sides and turn off the edges a little less in diameter than the hole to be bored; I turn up a plate perfectly true on its sides with a hub on one side to fit the hole in the head. Now I chuck this plate on the face-plate of a lathe, with hub sufficiently out of center to bore hole for the cutter. The head is now clamped into correct position for boring one hole (independently of the plate); the hole is bored. Now I loosen the head after having one hole bored, and swing the head around on the hub, in position to bore the other hole, which should be exactly opposite the one already bored. This makes these holes equidistant from the center of the head, thus insuring perfect truth on the periphery of the cutters.

The holes being bored, we proceed to chase the thread for the cutter shanks. After having one hole chased without uncoupling the screw on the lathe, we swing the head back again into its former position, and chase the hole first bored with the same setting of the tool. This makes the thread enter on both the holes in the same relation to the center of the head. Thus the advance is equal on the cutters when cutters are made alike.

We now have a correct head, and one that will remain so. The holes for the set screws can be tapped, as there is nothing very accurate required in them. To make the cutters alike, after chasing them we screw them in a chuck on the lathe, so that they will bottom on the end; then turn them to the proper length (and of same length), and chamber out the end; then screwing into a similar chuck on a milling machine, the cutting edge *b* is formed in exact relation to the thread, and, by retaining the same position of the chuck, they are practically alike. After this they are screwed into the chuck again on the lathe, and the face cut spiral by gearing lathe to same pitch as the thread on their shanks, and cutting the face down by turning the lathe back and forward until the surface is cut spiral to the cutting edge, and the cutter is ready for hardening. In boring the head for the cutters, we get the diameter from center to center as near correct as we can, so as to be sure the cutters are large enough to make proper size.

Now, we will say we want a head to bore an 8″ standard hole; we count on making the cutters 1.5″ diameter. This would necessitate the holes being exactly 6.5″ apart, but we will suppose we get the holes about 6.494″ apart, but have no ready means of knowing what it is exactly. Yet we must know, in order to get a standard cutter. A safe plan for this is to first grind both the cutters on a grinding machine to one size; then screw them into the head, and measure across with the vernier caliper or measuring machine, and, whatever we find the measurement in excess of the standard we want, that much we must reduce the diameter of each cutter. The result, of course, will be, in case above-named, 1.506″ diameter of the cutter. We now stamp the head an 8″ standard, and at each of the holes in the head we stamp 1.506″, the size of the cutter. When new cutters are wanted thereafter, the size is 1.506″ for that head until the head is worn out.



Boring Tool.

A variation of size could be made on the same head by having larger cutters to replace, but for special work it is not advisable to do so. For the work which I made these cutter-heads, I made two heads—a roughing and finishing head. They are fixed upon a short bar for use on a drill press, and are changed about as needed. If only one bar is used, the heads can be readily changed by the means shown in the drawing.

Four cutters can be put into one head as well as two, with the same accuracy and good results. They can be used for any size holes on boring and turning mills by fixing them in the manner described into a bar, and fastened into the tool-holder of a boring machine.

While, no doubt, a plan of making this tool would have been clear to a great many of your readers, yet to a number it may be of advantage.

A. B. Landis.

Cranky Screw Tools.

Editor American Machinist:

I don't see any use of making so much ado about Mr. H.'s No. 32 thread screw cut with No. 16 thread dies. Any one that has worked with dies and taps such as were in use 30 or 40 years since must have frequently observed the same thing in one shape or another, and not thought of writing about it.

Of course I will admit that it may be a sort of curiosity to the younger grade of mechanics who have been brought up in the use of good tools with some one to make and keep them in good order for them. About 30 years since I saw a tap with an 18 thread that was made under a bet that a certain mechanic could make a tap that would cut a right-hand thread and also a left-hand thread at the will of the operator.

Well, the tap was made and the bet won by the maker, as the tap cut both kinds of thread much better than might have been expected and without any difficulty.

As to dies, I have seen many of them that would scarcely ever cut just what they were made to cut, but would persist in cutting double, triple or more threads; sometimes right and sometimes left hand; and as if to add insult to injury, they would frequently cut no thread at all, but merely revolve in the same groove, taking this peculiarity perhaps after the man who made them.

The first taps that I remember of seeing when I was a boy were pretty sure to cut what they were made to cut, from the fact that they were not fluted, and therefore there was but small chance of their getting off the track.

I often think of the old style tools as they appeared in my father's shop; they would be a great curiosity at the present day.

My father was considered a very good tool maker in his day, and was the first to flute taps and dies that I know of; in his time it was not unusual to file threads on any odd size screws, as he filed thousands of threads on augers, locks, screws and vise screws, press screws, and taps too, when he wished to make a new size or thread.

The oldest style of tap that I have seen were plain tapered plugs without flutes; the next style was the same with three or four flutes, not larger nor deeper than the thread.

Then we have the four square tap; this had somewhat of a run, but it was soon superseded by the four large flutes; this was quite an advance on the former styles, but lacked one more step to make our most complete tap of to-day.

The writer relieved taps fifteen years before any other maker did so, to the best of his knowledge.

A. F. Ward,
Cleveland, O. Tool Maker.

Balancing Engines.

Editor American Machinist:

I wish to answer Mr. Redfield as far as he refers to what I have written upon balancing engines. In the American Machinist of September 26th, 1885, page 5, he says: "It appears that a good many of your correspondents consider that that part of the connecting-rod which is centrifugal in effect, does not have the same effect in modifying the pressures on the crank-pin that the other reciprocating parts have." The effect is similar, but not the same. On account of the angular vibration of the connecting-rod the inertia force is greater than the centrifugal at the back end, and less at the front end. I would refer Mr. Redfield to the American Machinist of Nov. 1, 1884, page 3, Fig. 8, by which I have fully explained the matter.

I do not wish to change the wording of the sentence which he quotes as follows: "The best general balance is secured when the counterweight equals one-half the weight of the reciprocating parts, increased by that portion of the connecting-rod which may be considered as centrifugal in effect."

Suppose the weight of reciprocating parts to be as follows:

Piston, Piston-Rod and Nut	750 lbs.
Crosshead	700 "
Connecting-Rod (entire)	900 "
Total	2,350 "

Proportion of connecting-rod considered as centrifugal, 400 lbs.

Then the counterweight would be according to the above proportions, as follows:

$$\frac{2350}{2} + 400 = 1575 \text{ lbs.}$$

I do not wish it understood that I would advocate this proportion of counterweight, or any other proportion. The object of the article referred to on balancing was to give a mathematical demonstration of the effects of differently proportioned counterweights, rather than to attempt the establishment of any rule. There can be no universal rule. It is a matter that must be decided by the engineer as to how much of vertical balance he thinks prudent to sacrifice in establishing horizontal balance. In distributing the weight of reciprocating parts the question to be decided is, how much vertical friction is it best to put on the crank-pin in order to secure a general balance by placing the weight about or beyond the pin, and counterbalancing by a weight in the opposite side of the crank-disk. But, first of all, it is most essential to determine the proper weight for reciprocating parts entire. In modern high-speeds, it will be found best to avoid weight as much as the requirements of strength will admit of. If it is found best to add weight, the best place to put it *may* be found to be at the crank-pin.

I have one case in mind now, however, where the crank end of connecting-rod was too heavy to admit of best results, the vertical stress being so great as to wear the boxes badly out of form. Aside from any practical considerations, the best theoretical balance would be secured, it appears, by putting the surplus material at the crank end of connecting-rod, and counterbalancing it in the opposite side of the crank-disk, as suggested by Mr. Redfield and others.

Ed. F. Williams.

To Find the Half of a Mixed Number or the Radius of a Circle.

Editor American Machinist:

I stumbled upon the following method one day while worrying over some fractions. It is new to me, and I have found it so convenient, and such a saving in chalk and pencils, that I offer it in hopes it will benefit some one else: If the whole number is an odd number then half of it will be the nearest half of it (whole number), and for the fraction add the numerator and denominator together for the numerator and double the denominator for a denominator. Thus to find half of $11\frac{13}{32}$: the nearest half of 11 is 5, then 13 added to 32 is 45 for the numerator, and twice 32 is 64 for the denominator; $5\frac{45}{64}$ is the half of $11\frac{13}{32}$.

This, of course, only applies to cases where the whole number is odd; when it is even it is easy to divide by 2 for the whole number and double the denominator for the fraction. But for odd numbers always coming along I find the above plan to save me much trouble as the operation is so simple as to be done in the head almost instantly.

Chas. C. Hunsberger.

Change of Pitch in Locomotive Bells.

Editor American Machinist:

Mr. Joseph P. Noyes, on page 6, No. 39, in speaking of change of pitch in locomotive bells, has got at the right answer to the question, but he does not carry it quite far enough.

Supposing two trains were running in opposite directions at 60 miles per hour each, the bell strikes when they are 1,156 feet distant. Those trains would pass in about six seconds. Now then, it would requi

one second for the sound of the bell to reach the other train, so all the sound made in six seconds must be heard in five.

A bell that gives alto *C*, vibrates 528 times per minute. Here are 3,168 vibrations heard in five seconds, which is at the rate of 633 per second, or not quite up to *D*, which requires 660 vibrations.

As we approach, the vibrations get nearer, we get them quicker, and when the trains pass they are heard as they are made at the rate of 528 per second.

The rule holds good as the train departs. When it has travelled 1,156 feet, or six seconds, we require seven seconds to get the whole number of vibrations. This is equal to 452, or almost down to *B*, which requires 462 vibrations per second.

James F. Hobart.

Balancing the Reciprocating Parts of Steam Engines.

Editor American Machinist:

I do not revert to the above subject for the purpose of getting into a controversy with Mr. Redfield, but to correct the language I used which, as I put it, did not correctly express my meaning. When I used the words "pressure on the crank pin," I should have said "rotative effect on the crank pin." Not that I am sure that there is any difference in the two, but I had an instinctive notion that 100 pounds weight in the piston or crosshead of an engine would absorb more of the initial force of the steam during the first half of the stroke, and give it off during the last half, than the same 100 pounds would do if concentrated in a disk and hung on the crank. As has been shown by Mr. Redfield, it is very true that the disk would tend to equalize the pressure and wear on the pin; still, I think the starting and stopping of the 100 pound weight is more of an item than the simple tendency to divert the same weight from its circular path, without changing either its speed or direction.

John E. Sweet.

Moulding Hammer Dies.

Editor American Machinist:

Mr. Masters, in a recent issue of the American Machinist, showed a method for moulding hammer dies. As I have a method which I think is simpler, I offer it for consideration. In the sketch, 3 is the cope pattern and 4 is the drag pattern.

Have the cope pattern, 3, made the shape of casting when finished, and divided in two parts, 1 and 2, as shown; then, when you lift the cope off, draw out section 1 of cope pattern first, then move section 2 along in the mould until it will clear the sand and draw it out. Afterward draw the pattern, 4, out of drag, cut your gates and the flask is ready to close. You do not have to change section 2 around and fill in with sand, which takes some time; and, if you are not very careful, you will shove it out of its place in tucking in sand behind it according to Mr. Masters' method.

Mr. Masters also speaks of moulding the hammer die with the cope pattern in one piece. He says that to cut away the sand at one side of cope pattern, so as to draw it out of sand, makes a very poor job, and also makes a great deal of work for the machinist to plane the dovetail so that it will fit the hammer. He is right there, but if he will cut the sand away at one *end*, instead of at the side, far enough to slide the cope pattern along until it is clear of the mould it forms, and then draw it out and refill the place cut out with sand, it will not spoil the shape of the dovetail part of the casting, and will not make extra work for the machinist.

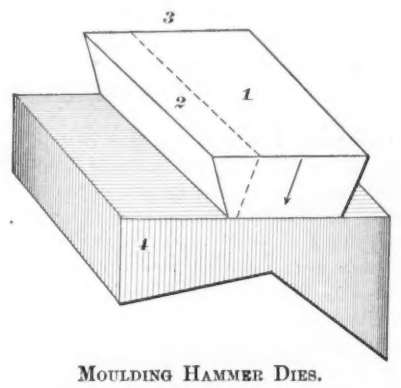
H. E. Kimball.

"Evening classes" will be organized in the rooms of the Young Men's Christian Association, Providence, R. I., during October, in which a number of branches are to be taught, including mechanical drawing, penmanship, book-keeping and short-hand. Mr. Wm. L. Coop, of that city, who is interested in the movement, informs us that they have already received enough applications for instruction in mechanical drawing to form quite a class. In this branch two classes are proposed, for beginners and advanced students.

The Miller Grate-Bar.

This grate-bar, the invention of Joseph B. Miller, Wilkesbarre, Pa., is designed to bring about more perfect combustion of fuel, and is suitable for all sizes of coal, culm screenings, waste, etc.

It consists of a perforated and grooved top plate divided into a number of sections, having narrow spaces between their adjacent



Moulding Hammer Dies.

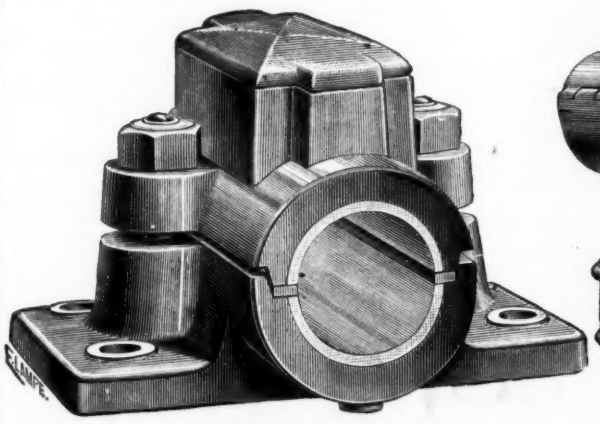
ends. These sectional plates are cast on lugs on the supporting rib, whereby the air can circulate freely through and around the top plates, thereby securing thorough combustion of coal and equalizing the strains resulting from expansion and contraction, thus avoiding warping.

The short section of the perforated plate being cast solid to and elevated above the supporting ribs by means of lugs, together with the equal distribution of metal, renders the bar durable throughout.

The perforations in the plate can be regulated to any size or kind of fuel.

The rib or central bar is not liable to break or warp owing to the distance from the fire, and to the fact that the air which supplies the fire with oxygen keeps it cool in passing.

The awards to the machinery exhibitors are very much what might have been expected. In order to avoid giving offence, the jurors have distributed a large number of gold medals—there are 157 of them in all. So wholesale a distribution of this distinction has given rise to complaints, which are very natural on the part of those who believe their machinery to be far ahead of that of any one else in the same line, and who find several of their competitors placed on the same footing. There are besides various other complaints, some of which seem to demand, in the interests of fairness, a full investigation. For our own part, we have before expressed the opinion that the practice of bestowing medals and awards, except under very special conditions, is not to be encouraged. The task of making exhaustive trials, and investigating the merits of the whole of the exhibits shown, is physically impossible if thoroughness is regarded as an essential.—*The Machinery Market.*



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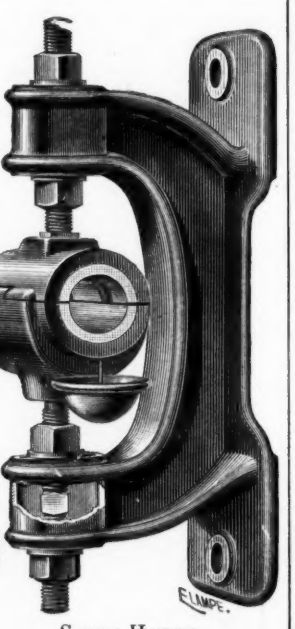
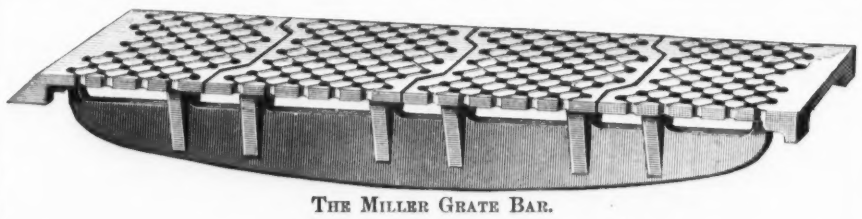


Shaft Hanger.



The Miller Grate Bar.

Work at Roach & Son's Yards.

Matters are very quiet at the shipyard of John Roach & Son, Chester, Pa. On September 16th a few men were at work upon the compartment pipes of the U. S. monitor Puritan. These pipes are for the purpose of pumping water from the various compartments into which the Puritan is divided by iron bulkheads.

Before going into action, water will be admitted to some of the compartments, and the monitor becomes nearly submerged, and is thus protected from the enemy's fire.

Boilers for a new iron ship have just been completed, and placed in position in the Sarah A. Jenks, built by the Pioneer Iron Works at Marcus' Hook.

A new propeller blade or two for a steamer of the Galveston line and a propeller wheel of charcoal iron forms the sum total of present business.

Individual opinion states that there is not much prospect of an adjustment of yard matters before Congress meets. Then they are in hopes to see the cruisers finished.

Messrs. Roach & Son have taken advantage of the stoppage to put things in first-class trim. Machinery is overhauled, painted, and presents the appearance of being ready when the word does come to start.

"Whitney has got some of our best men up in Brooklyn," said a gentleman who knew. "He has got more of them engaged, and on waiting orders."

New Shaft Hanger and Journal Box.

The shaft hanger and journal box illustrated herewith represent recent improvements by the Medart Patent Pulley Company, St. Louis, Mo.

The shaft hanger is of the type in which the box is held between two screw bolts. These bolts are square at and near the center of their lengths to prevent turning in the holes through which they pass; they are adjusted by means of the nuts shown at top and bottom. The holes or slots through which the bolts pass are made oblong, laterally, so that the bolts can be shifted in them to align the shaft, and then made fast.

The upper of these adjusting bolts is fitted at its inner end in a square or oblong shoe or step, which in turn fits in a recess in the hanger. This shoe exactly fills the recess in the hanger in one direction, but in the other direction, that is lengthwise of the shaft, the shoe is free to move in the recess. This permits the box to shift itself into alignment with the shaft, in a way that will be clearly understood, while the other arrangements provides almost any degree of shifting for alignment in the other direction.

The combination described permits a large range of adjustment of the box to suit the position of the shaft.

The journal box shown is made with a tight oil box over the journal. This oil box is provided with a wick passing over the end or the side of the box, and down through an opening in the box at the top of the journal, on the principle of a siphon; the under side of the box is provided with a groove running parallel with the journal, so that the heat of the journal acting on the wick will cause the oil to flow as it is needed. Thus, when the journal becomes warm by friction it will heat the wick, thereby warming the oil, and drawing it out of the upper box or reservoir.

Labor in Europe Contrasted with American Labor.

The recently-published reports of the U. S. consuls on "Labor in Foreign Countries" (three volumes) deserve more attention than has been directed to them by the general press. Rates of wages, cost of living, social and moral condition of workingmen and women, are reviewed in all the important countries of the world. A great contrast with wage-workers in this country is noticeable in almost all the reports. The condition of the American workman is greatly superior to that of the workman in any foreign country. Here he has the power to advance himself without any traditional restrictions, but abroad his progress is hampered, if not entirely barred, by peculiar conditions of society and adverse governmental institutions. Still, there are some laws and customs for the benefit of workmen in foreign countries that could well be adopted here. In Germany, for instance, the workman cannot be robbed of his earnings by the "company store." His wages must be paid in cash, and he is free to buy what he wants anywhere he chooses. In England the workman is not forced into an unequal competition with prison convicts in manufacturing goods.

We make as many extracts from these consular reports as our space will allow this week.

Consul Smith, at Mayence, Germany, says:

"The working people are free to purchase the necessaries of life wherever they please, and employers are prohibited from imposing any restrictions in this regard. The law obliges employers to pay their men in the currency of the empire, and does not allow them to credit their men with all sorts of goods, but permits them to supply the necessaries of life, and to charge the same against the men *if furnished at cost prices;* and dwelling-places, board, fuel, medicines and medical attendance, as well as tools and materials, can also be afforded, but further than this are all engagements and contracts void at law.

"Wages are usually paid weekly in imperial money, as said above."

Consul Lathrop, at Bristol, England, says:

"(1.) No class of laborers is as intelligent as the corresponding class in the United States.

"(2.) In consequence of this comparative lack of intelligence, the laborer is not so valuable to his employer as in the United States. He is less receptive of ideas, and requires more oversight and more directing and accomplishes less in a day.

"(3.) He is improvident, and does not save. Sometimes he cannot; but, as a rule, he spends some portion of his income with bad judgment, which portion he might lay by.

"(4.) His wages are less than in the United States.

"(5.) There is not a corresponding cheapness in the price of all commodities. Rent is cheaper; but if the laborer expends less in some other directions than in the United States, it is because he does without or buys an inferior article, not because the articles are cheaper.

"(6.) The employment of women is more general than in the United States. There is some female member contributing towards the support of almost every laborer's family.

"(7.) The laboring class is not so self-respecting or respected as it is in the United States."

Consul Shaw, at Manchester, England, says:

"The practical working of this co-operative system is strikingly shown among the Oldham cotton-spinning companies. The first co-operative mill for producing yarn was established in Oldham about twenty years ago. Previous to this date some attention had been given to the manufacture of calicos there in this way, but the venture soon gave place to the spinning of yarn. During the past twenty years some seventy spinning mills have been built in Oldham, on what is popularly called the "limited liability" principle—*i. e.*, co-operative mills, in fact—and more than 5,000,000 spindles are in full operation there, representing a capital of over $30,000,000. The shares are usually limited to $25 each, and workingmen and small capitalists own a considerable portion of the same.

"The practical management of these mills, is probably the most inexpensive and the most perfect of any similar enterprises in the world. The directors are usually five or seven in number, and are chosen by the shareholders out of their own body. It is the rule to select expert and practical workmen for these positions of trust, and this plan insures the most capable and best informed supervision over all details that it is possible to select. The average compensation for directors averages less than $100 a year; probably $90 would be nearer the amount paid each. I think it a very surprising and most complimentary fact that during the past twenty years in the history of these Oldham mills, covering an output of hundreds of millions of dollars, not a single criminal investigation has been necessary into the conduct of any director.

* * * * * * *

"To carry the principle of independence into as many branches of supply as possible, a biscuit and confectionery establishment near Manchester was purchased in 1873. To this the manufacture of dry soap was added, the annual output of both being about $100,000.

"In the same year a boot and shoe manufactory was opened at Leicester. This has been a marked success, and the annual production is now fast approaching $1,000,000. In 1880 another similar work was opened at Hockmondurke. Here the production is about $100,000 a year. Soap works were also opened at Durham in 1874, the output of which amounts now to something like $100,000 a year."

Consul Schoenle, at Barmen, Germany, says:

"A fixed distinction of rank in Germany being interposed as a barrier between employer and employe, their mutual relations are somewhat strained and not of a cordial and familiar character. The employe is made to feel his inferior rank and his dependence, on almost all occasions. Workingmen rank as a class and move in a low and gloomy atmosphere. It is only of rare occurrence that a workingman or the son of a workingman is able to climb up to a higher social scale, through lucky circumstances or through intelligence. Very seldom he can rise in his calling. He can scarcely cherish any ambition. It is therefore but natural that the workingman is either dull, reckless and supine, or is disposed to follow the teachings of the Socialists and throw himself into their embraces. In this connection it is, however, proper to state that the doctrines of Socialism and Communism do not elevate the laborer to a higher scale of proficiency and morality; on the contrary, they are apt to drag him down and excite an inclination to excesses."

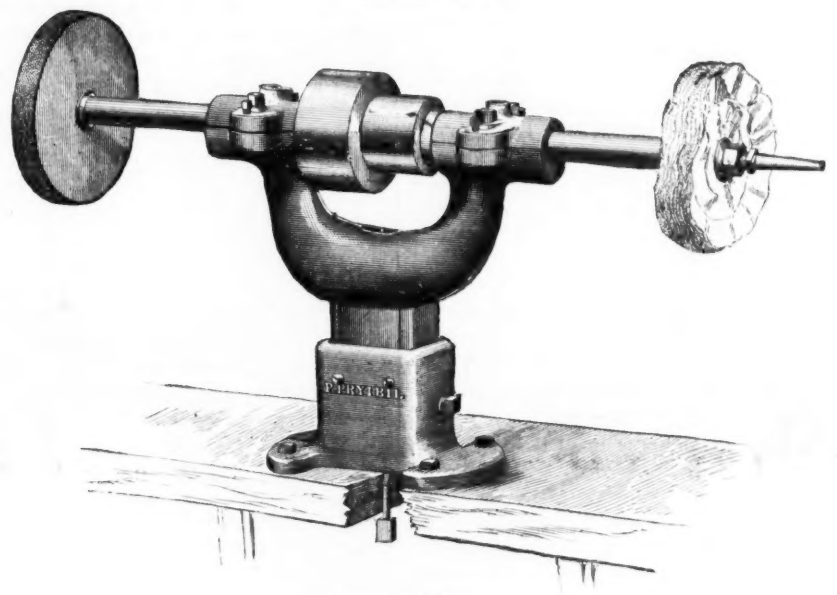
Consul Grinnell, at Bradford, England, says:

"In regard to the mutual feeling and relation between employer and employed, I would say that the old spirit of loyalty and fealty to the master which formerly existed, in a strong degree, and which now exists in some country communities, has entirely died out in large manufacturing towns, and the relations between masters and workmen are confined now simply to the exigencies and requirements of business, the master knowing few or none of the workmen under his employ, and the workingman remaining with or deserting the master in proportion as the wages offered are equally great or less than his competitors."

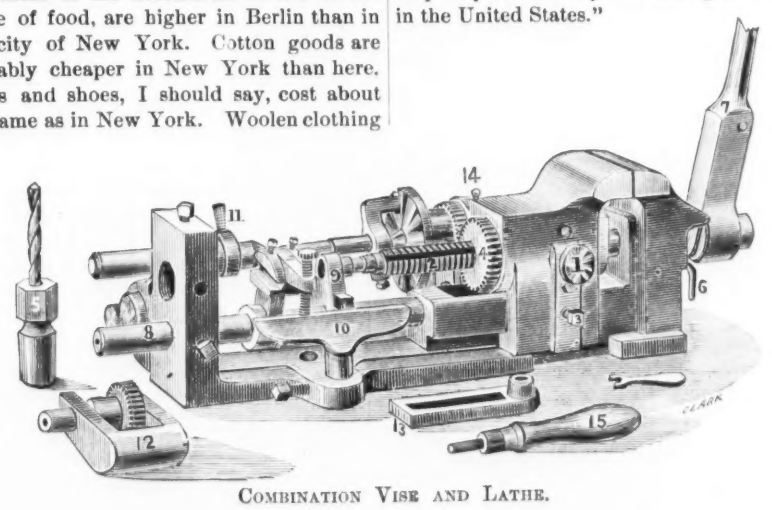
Consul General Brewer, at Berlin, Germany, says:

"My own experience as a housekeeper in Berlin convinces me that tea, coffee, sugar, and most of the necessaries of life in the shape of food, are higher in Berlin than in the city of New York. Cotton goods are probably cheaper in New York than here. Boots and shoes, I should say, cost about the same as in New York. Woolen clothing is 30 to 40 per cent., table linen 20 to 30 per cent., silk goods from 10 to 25 per cent. cheaper here. For some reason, which I am unable to explain, woolen blankets are but very little cheaper, if any, here than in America. This is also the case with woolen underclothing. There are very many things, such as china and porcelain wares, glass buttons, laces, gloves, hosiery, etc., which are cheaper here than in America. I have no doubt whatever that one can live in America as cheap as he can in Germany if he will live in the same manner. I know the question is often asked in America: How can the laboring people in Germany live if they receive such a small pittance for their labor? My reply is, simply because they do not live as well as the laboring classes do in America. They also are, as a rule, much more economical in their expenditures and in their manner of living, and every member of the family who can labor must do so in order to assist in caring for themselves and the general household. The laboring women here are accustomed to perform the hardest of manual labor on the farm, in the shops, about the mines, etc. Such labor as would only be performed by the strongest of men in the United States."

Soldering Forge.



Buffing Machine.



Combination Vise and Lathe.

New Buffer.—New Soldering Forge.

These tools represent new designs made by P. Pryibil, New York. The buffer is arranged to carry two wheels besides the one which may be placed on the tapered screw. When the nature of the work renders it desirable this screw may be removed.

The spindle is of steel running in adjustable babbitted self-oiling bearings, and is provided with a cone-pulley of two steps for varying the speed. Tight and loose pulleys can be substituted, if desired. The height of the spindle can be varied, and thus the stretch of the belt taken up, by loosening the set-screw at the side of the loose piece and operating the screw which projects from the bottom through the bench. The diameter of spindle is $1\frac{7}{16}$"; whole length of spindle, 43"; distance between the two main wheels, 34"; height to center of spindle, $14\frac{1}{2}$" to $16\frac{1}{2}$"; diameter of cone pulleys, 4" and 6"; width of belt, $2\frac{1}{2}$".

The soldering forge is designed for the use of hard coal in soldering brass work, and is generally used in combination with a blow pipe. It consists of an iron table standing on legs and provided with a fire-pot in the middle, lined with common fire brick laid loosely in place. These can be easily renewed when burned out.

The blast enters a large chamber under the grate, and supplies air equally to all parts of the fire. The latter is dumped by withdrawing a slide at the bottom and a pin at the front of the air chamber.

Combination Vise and Lathe.

This tool is designed for use in the machine shop; also by amateurs, inventors, jewellers, dentists, and for general repairs. It combines the slide lathe, drill press and vise. The wear and tear does not affect the character of the work. It has automatic feed, and can be used by hand, with a treadle or by power.

When used as a vise, the nut is locked by No. 1; No. 2 is secured by the bent pin being placed in the groove; No. 3 is loosened.

When used as a lathe or a drill, No. 1 is loosened, and the nut is allowed to turn with the screw. No. 4 is placed in position as seen in the cut, and acts as driver for the lathe and feed for the drill; withdrawing pinion and connecting driver and nut prevents all feed; the feed is positive. The square-shank chuck No. 5 is preferred; it prevents all slipping of the drill and the breaking of the same. When using small drill, the hand-screw in standard may be used to advantage. No. 7 can be slipped off and used as a wrench, and a hand-grooved wheel substituted. No. 11 adjusts the work in centers, the centers being stationary give to the work great solidity and equal wear; they can be thrown down when needed by loosening one screw, or can be used as a hand lathe when desired.

The machine is made by James R. MacMillan, West Philadelphia, Pa.

Old Files that Look New.

According to the *Sun*, the Kearney & Foote Company, one of the largest manufacturers of files in the country, have lately received complaints of worthless goods bearing their trade marks. Recently one of their agents learned that a Jersey City dealer had had an offer of a large lot of files at remarkably low figures. The would-be seller represented that he had secured a supply of files at a sale of unclaimed express packages. An arrangement was effected which secured the presence of a detective, when two men called at the dealers and effected a sale.

Receipted bills showed that the sellers had purchased large quantities of scrap files from the Singer Manufacturing Company. An acid process gave the worn-out files a new appearance. A trial showed they would hardly cut lead, the acid having ruined their temper.

The heads of the different departments of the Eclipse Wind Engine Company, of Beloit, Wis., recently presented the manager of the works, W. H. Wheeler, with a fine gold watch, the occasion being the opening of the company's new shops.

Germany has one flouring mill to every $2\frac{3}{5}$ square miles; the United States one to every 160 miles. There is, however, a difference in the size of mills.

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☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, OCTOBER 10, 1885.

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Taxes and Manufacturers.

The prodigal waste of money raised by taxation in large towns and cities frequently has a depressing effect on manufactures. In many cities there appears to be a regular increase in tax rates, which is likely to stop no one knows where. Such a state of affairs prevents the location of manufacturers, for the sufficient reason that they cannot compete, under the load of taxes imposed, with those more favorably situated in this respect. This is something never considered so fully as it should be; it is a strong plea for honesty and business principles in the expenditure of money raised by taxation. Nothing places a town or city in better condition to meet necessary taxation than the presence of large manufactories, distributing money to a large number of workmen.

In some of our Northern and Eastern cities the tax rate is three per cent., and increasing year by year. It cannot be expected that manufacturers will be anxious to establish themselves where they will be burdened, or overwhelmed, with such a load; on the contrary, those already there will be likely to consider the propriety of moving elsewhere in self-defense. Other towns and cities, alive to the advantages, offer to abate taxes altogether for a term of years; with honest and business-like methods of officials, we do not believe there would be any need of resorting to this last-named expedient, the justice of which is, to say the least, questionable. Manufacturers do not object to bearing their share of public burdens, but they do object to taxation about equal to profits they would be satisfied with. In such times as we have been passing through this burdensome taxation is, in many instances, where business has been done at little or no profit, unbearable. We commend this view of the case to the lawmakers. In too many instances they seem to lose sight of the fact that, when they succeed in driving away manufacturing, they will not find it easy to raise even the money required for the honest administration of affairs.

The gradual improvement in business, of which we have previously spoken, so far shows continued evidence of being permanent. From all parts of the country we hear encouraging reports of increased activity. In some instances improvement is very slight, and in all instances it is slow, but we believe it is sure. Sales are everywhere a little better, and inquiries much more numerous. There may be some lines of trade or business in which improvement is not yet felt, but it is general, and must reach all. In Chicago and the West the feeling is, if anything, better than in the East; but looking back for two months we believe improvement can be seen everywhere. Patience with the slow mending of trade is a necessary virtue, and there will undoubtedly be occasion to exercise a good deal of it yet. But, once satisfied that the mending process is going on, every one should be willing to wait a little. Stocks of manufactured goods are low, and, as the demand comes up slowly, it must at once be felt in the shop and factory. This is better than that improvement in manufacture should have to wait the depletion of large stocks.

Inventors could do nothing more worthy of general commendation than invent a torpedo that would with certainty destroy any war ship that can be floated. Probably the lucky inventor would at the same time make his fortune, but that is a secondary consideration. Millions of dollars are thrown away every year in building monster war ships, and this is a constant burden upon productive industries. These ships when still and in the presence of enemies surround themselves with netting to ward off approaching torpedoes. At present efforts are in the direction of sending along a double tandem arrangement of torpedoes, the first of which shall break a hole in the netting through which the second shall pass and strike the vessel. By another proposed arrangement the torpedo is towed along by the motor, and when the latter strikes the netting an arrangement is set in operation that causes the torpedo to dive under the netting, and coming up beyond it to strike the vessel. We hope that complete success will attend the efforts of torpedo inventors.

There are lots of "mechanical cranks" alive yet. If the men who expend their money upon perpetual motion machines and like notions would pay one dollar for a natural philosophy, and learn one or two principles of the lever, they would not waste their time in trying to double up speed while using half the power, by means of impossible machines.

The Bureau of Labor Statistics of the State of Pennsylvania has been obliged to discontinue its work, owing to the appropriations being exhausted. Much difficulty has been experienced in collecting reliable information, owing to a disinclination on the part of employers to furnish the facts.

"Beginning the Winter Term."

The above head lines are very common in the daily press at this season of the year; it is perhaps needless to say that they generally refer to the opening of the winter terms of colleges. But they have a further significance. There is in all parts of the country a growing tendency to establish industrial and technical schools, and many new ones have in a modest way been established this year; and the winter term is about to begin. These are excellent schools for apprentices and mechanics to attend, and those within reach of them should look well to the time of their beginning, and be on hand.

When there are no such schools within easy reach a very little effort will establish one; the present temper of the people is such as to induce them to render every possible service in this direction. In any locality where there are a hundred mechanics, if three or four are sufficiently interested they will be able to start such a school. Employers will invariably help the matter along, and there can always be found those who will volunteer their services as instructors. The expenses at the most will be but a trifle.

The beginning of the winter term at such a school is of more importance to the material interests of a town or city than the beginning at any college in the land; and it is of still greater importance to the students.

There may be those so situated that they cannot get to such a school, or bring about the establishment of one. For such it is a good time to begin systematic study for the winter, all by themselves if needs be; almost as much can be accomplished in this way as in any other, if the effort is persisted in.

Mechanics and engineers should not make the mistake of supposing that it is not in a greater degree necessary for them to read and study in these years than ever before. A few years ago these men did not read or study much in the direction of their work. To-day a large percentage of them are persistent students in this direction; those who are not will in the future find themselves at serious disadvantage with those who are. It is time to begin some kind of a winter term.

The old-fashioned foundry or shop crane, with its big spur gears and cranks, is a thing of the past. It must go. Put an overhead travelling crane in your foundry and see how much more room, light and dollars you will have to work with.

The Tests of Car Couplers at Buffalo.

The Executive Committee of the Master Car Builders' Association, which recently met at Buffalo to grapple with the car coupler question, had a lively time. There were, however, only forty-six of the several thousand couplers in existence presented for trial, and the proprietors of four of these not putting in an appearance, only forty-two were tried. What the fate of the committee would have been if every owner of a car coupler had put in an appearance may be imagined, perhaps. Of course, each owner of a coupler had the best, and, as the committee recommended only twelve, the owners of the others do not think they knew much about coupling cars any way. Some of them even say that no couplers were recommended except some railroad official was pecuniarily interested in the invention. Really, however well the committee did their duty, which was not a pleasant one, it does not seem that they have settled anything; this was probably impossible. It is probable that railroads will try the couplers recommended by the committee, or those they did not recommend, just as the officials see fit to do, and in the end these trials in active service on roads will show which is best. In the meantime inventors will see to it that the committee have plenty of others to try at their next meeting for this purpose.

A correspondent is desirous of knowing the cheapest and simplest way of washing old waste used in a machine shop; also what material is best for painting white the bodies and pipes of shop stoves; something that the color will not come off nor injure the iron by eating into it. If any of our readers can furnish the desired information we should be pleased to publish it.

A philosophic German is of the opinion that newspaper reading is to blame for the decreased production of solid scientific works. Perhaps readers get their information with less trouble through newspapers.

Not Creditable.

A mechanic asks the Boston *Herald* the following question, which may just as appropriately be asked in this city: "Why should policemen ride free on the horse-cars after finishing their day's duty? I am a mechanic, and work hard ten hours a day. At night, if I have the necessary five cents, I may ride home, otherwise I must walk. A policeman loafs round the streets nine hours a day, and at night he boards any car he chooses and goes home for nothing. Perhaps this is all right, but I fail to see the justice of such discrimination."—*Commercial Advertiser.*

The above represents a phase of human nature not at all creditable. It is not the expression of a laudable desire to better one's own condition, but rather of an anxiety to make that of another a little less tolerable. It is something that in some degree troubles "all sorts and conditions of men;" here we find a mechanic and an editor or two afflicted with it. Either of these men would be ashamed to deadhead on street cars if he had the privilege of doing so; they don't have the privilege and some one else does, and that is where the trouble lies. The street roads charge a certain sum—a very modest one—for riding; they own and run the roads, and we fail to see what business it is of any one, besides the parties directly interested, if they pass certain individuals. Mechanics or editors would pay neither more nor less for their rides if policemen were obliged to pay, and it is an excellent plan when it is not possible to help another up, not to assist in pulling him down.

The only question we can see is one of propriety; the propriety of accepting a free pass, and in this case it is one to be settled by the city government.

Whether a man is a mechanic working in a shop or an editor editing a newspaper, so long as he is fairly treated, it ought not to trouble him that others get more than their deserts. Senseless objection to presumed extra privileges that curtail the rights of no one else, sometimes makes serious trouble in the affairs of life.

Nine out of ten shops drive their arbors. It is difficult to keep a driven arbor in good shape. It is reasonably sure to get out of truth, even if a lead hammer or raw hide mallet is used. Some first-class shops use a hydrostatic press to drive arbors with. They rig up a concern consisting of two rods, and a yoke at top of the press (whiskey jack). The top yoke is V-shaped. You can press out arbors with this rig, without battering them up, or spoiling the centers.

Literary Notes.

A GUIDE TO SANITARY HOUSE-INSPECTION; or, Hints and Helps regarding the Choice of a Healthful Home in City or Country. By Paul Gerhard, C.E., Consulting Sanitary Engineer; author of "House Drainage and Sanitary Plumbing," Hints on the Drainage and Sewerage of Dwellings, and Diagrams for Sewer Calculations. New York; John Wiley & Sons, 15 Astor Place.

The avowed object of the author of this book is to furnish information for the householder, to enable him to detect defects in the sanitary arrangements of the house he owns or occupies. To this end it contains instructions how to proceed in making the necessary examinations both inside and outside the buildings. It belongs to that class of literature that should be found in every house, and an acquaintance with which would save much sickness and inconvenience. The price of the book is $1.25.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(280) **A. R, Mt. Vernon, Ohio, will find** the question he asks answered in the issue of September 5.

(281) **J. C. W., Ont., Canada, asks: What** is the acting area of a propeller blade as distinguished from the flat area? *A.*—We assume that the acting area is the projected area of the blade as it stands at the angle due to the pitch. This would, of course, be less, in proportion to the pitch, than the flat area. The acting area would be the area acting on the water at right angles to the axis of the shaft.

(282) **T. C. B., Los Angeles, Cal., asks:** Will a pump draw water higher at the level of the ocean, or at an elevation above the ocean, and is there any rule for telling to what height it will draw? The height to which a pump will draw water is due to the weight of the atmosphere, and, as the atmosphere is heavier at the sea level than at higher altitudes, it follows that a pump will draw water higher at the sea level. The theoretical height to which water may be lifted by suction may be found by multiplying the pressure of the atmosphere by 13.6; the answer will be in inches. Thus, if the barometer shows a pressure of 30 inches, the height of a water column it will support will be $30 \times 13.6 = 408$ inches, or 34 feet. In practice, a pump will not lift water so high as this into from two to four feet.

(283) **F. K., Jersey City, N. J., asks: 1.** Is there any rule for calculating the diameters and lengths of journal bearings, the speed and weight upon them being known? *A.*—There is no rule applicable. It is one of the things in machine design that must of necessity be governed largely by circumstances. 2. How can I test a center crank-pin for truth, the shaft being in the lathe? *A.*—With a sensitive spirit level. 3. Would chilled cast iron make a good slide-valve, working on a face of medium grade cast iron? *A.*—Chilled slide-valves have been tried a good deal. Our experience with them is, that they are not so good as ordinary cast iron. 4. I suppose a longitudinal section of an object is one taken lengthwise; a cross-section, one taken crosswise, both to represent the object as it is from top to bottom, and a plan to be a view looking down upon the object. Am I right? *A.*—Yes.

(284) **J. W., York, Pa., asks: Will you** please give me a rule for calculating thickness for spherical shells of cast iron, and of malleable cast iron, shells to be, say 20″ diameter, and steam pressure 150 lbs. *A.*—It is generally assumed that for cast iron a tensile strength of more than 18,000 lbs. should not be assumed (some say 15,000 lbs.), and that to cover possible unseen defects a factor of safety of 10 should be used. To find the thickness of a spherical shell of cast iron, with a factor of safety of 10: Multiply the radius by 10 times the steam pressure, and divide by the tensile strength multiplied by 2. For the example given this would be

$$\frac{10 \times (150 \times 10)}{18000 \times 2} = .42 \text{ inch},$$

nearly. To find the pressure for a given diameter and thickness: Multiply the tensile strength by twice the thickness, and divide by the radius multiplied by 10. Example as above:

$$\frac{18000 \times .84}{10 \times 10} = 150, \text{ nearly},$$

We should not, with present knowledge, be willing to use malleable iron for the above purpose, and cannot quote any rule for its use.

(285) **H. A. L., West Newton, Mass.,** asks: 1. If a locomotive was to make a run of a given distance, 10 miles for instance, in one hour, then again in fifteen minutes, in which instance will the greater amount of coal be used? *A.*—We can only give our opinion, which is that the most coal will be used in the run of an hour. 2. What is the theory of spiral springs or why is the resistance to linear compression greater when the spring is wound at a greater angle with the axis, and greater when wound of small diameter than when wound of large diameter? *A.*—We cannot, in a brief space, give you the theory of the action of spiral springs. You may get a very good idea by taking two bars of steel, one twice the length of the other, then fasten one end in a vise, and with a dog on the other end twist the bars. You will find that you can turn the dog on the end of the long bar, say 20°, much easier than you can on the short bar. This twisting of the bar is substantially what you do with the spring when you compress (or extend) it. The long bar would make the spring closer wound, or of larger diameter; the short bar the spring "wound at a greater angle with the axis," or wound of smaller diameter.

(286) **J. A. S., Athens, Tenn., writes:** There is talk of bringing the water from a mineral spring to this place. The spring is on the side of a mountain, about 12 miles distant. The spring is 391 feet above this place, and 492 feet above the lowest point the pipe will traverse. The course of the pipe will be across ridges; the highest hill between the mountain and this place is about two miles from here, and is 134 feet higher than this place. The mountain slopes about 22½°, and this will be about the slope of the pipe at the spring. A pool would be formed at the spring so that the end of the pipe would be submerged. I want to ask: 1. What size pipe would be required to carry this quantity of water? *A.*—We should use 2″ pipe. 2. What thickness should the pipe be? *A.*—About the thickness of ordinary gas-pipe. 3. Should the pipe be the same size for its entire length? *A.*—We should make it of uniform size. 4. The water is strong chalybeate; would it deposit sediment in the pipe so as to clog it? *A.*—To determine this it would be necessary to submit the water to some competent chemist for analysis and experiment. 5. Should the pipe have a nozzle at its end? *A.*—No. 6. How high would the water rise in the pipe? *A.*—To about the height of the spring; there would be no flow at that height. 7. About how long will the water be in passing through the pipe? *A.*—About 24 hours.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

J. Clayton, Air Compressors, Rock Drills 43 Dey st, NY

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies. Ferracute Mach. Co, Bridgeton, N.J.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Curtis Pressure Regulator and St'm Trap, Sep 26, p 13

Tack, wire, and shoe nail machinery; Wm. A. Sweetzer, Brockton, Mass.

Treatise on gear teeth and bevel gears; specimen pp free. Geo. B. Grant, 66 Beverly st., Boston, Mass

Universal grinders for lathe-centers, chucks, angles, or cylinders. C.C. Hill, 84 Market st., Chicago, Ill.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Improved Labor-Saving Upright Drills: prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Machines to form and bend steel and iron; run by power. Williams, White & Co., Moline, Ill.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham st., N. Y.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Reid & Barry (cloth printers), Passaic, N. J., say: "Messrs. Hine & Robertson, 12 Cortlandt st., N. Y., The Kellam Pressure Regulator has given us the most perfect satisfaction. We cordially recommend its use in reducing steam pressure."

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

MANUFACTURES

A flour mill is to be built at Keller, Texas.

J. A. Claflin & Co., Milton, Fla., will erect a large saw-mill.

A new shoe manufactory is to be built at Nashville, Tenn.

Campbell & Bower are to erect a saw-mill at Denmark, Tenn.

George F. Montgomery, Albany, Ga., will build a planing mill.

An electric-light company has been organized at Shreveport, La.

The Alabama Ochre Co. will erect paint works at Montgomery, Ala.

The Nashua, N. H., Iron and Steel Co., are building a new plate mill.

The Eddy Valve Co., Troy, N. Y., have orders for several months ahead.

The citizens of Leesburg, Fla., are agitating the question of water-works.

The Mahoning Valley Iron Company, Youngstown, Ohio, are building a new plate mill.

The Passaic Zinc Works, Passaic, N. J., has resumed work, after a long spell of idleness.

The Pleasant Paper Mills, Green Bank, N. J., are building a three-story addition to their mill.

The town of Beverly, Mass., has voted to put in water-works, to cost not more than $150,000.

The Somersworth Machine Co, Dover, N. H, will erect buildings designed to employ 300 men.

The Washington Iron Works, Washington, N. C., will enlarge its machine shop and build a foundry.

Smith's American Organ Manufactory, recently destroyed by fire in Boston, will be rebuilt at once.

A large number of men are at work on the U. S. monitor Terror, at Cramp's ship-yard, Philadelphia, Pa.

Youngstown, Ohio, will receive bids for lighting the streets and public buildings with gas or electric light.

The Woodward Iron Company, Wheeling, Ala., are to put up another furnace of a capacity of 80 tons.

The Seymour Chair Company, of West Troy N. Y., which has been idle for a year, is now in full operation.

The contract for building the axe factory at Gloversville, N. Y., which was destroyed by fire, has been awarded.

The Philadelphia Rubber Works, on South street, west of 24th, which were burned some time since, are being rebuilt.

The Baldwin Locomotive Works, Philadelphia, Pa., have an order for 28 new engines for the Missouri Pacific Railroad.

The Bellefonte Foundry and Machine Shops, Bellefonte, Pa., have recently shipped one of their Vulcan power hammers to Sweden.

The Whittier Machine Co., Boston, Mass., have recently shipped two tubular boilers, of steel, to the Royal Milling Co., of Victoria, British Columbia.

The Indianapolis Rolling Mill Co. are making arrangements for adding to their plant Chapin's pneumatic process for making iron.—*Iron Trade Review.*

The Mason Harvester Co. at present located at Sumpter, S. C., contemplate erecting works at Charleston for the purpose of building the Mason cotton picker.

Rush & Sprague's flouring mill, recently burned at Leavenworth, Kansas, was the largest in the State, having a capacity of 800 barrels per day. It will be rebuilt.

Work on the Fort Worth and New Orleans railway was actually begun on Thursday morning. Five hundred men are employed on three divisions of the road.—*Brenham Banner.*

The Washington Mills, Lowell, Mass., which formerly gave employment to nearly 3,000 operators, are being put in condition for starting up. They have been idle for more than a year.

It is said that the works of the Union Iron and Steel Co, Chicago, will be started up shortly, giving employment to between 2,000 and 3,000 men. The company has been entirely reorganized.

A railroad is to be built from Fort Scott to Topeka, Kansas. The contract has been awarded to the Enterprise Construction Company, Col. Bush, President, of Lancaster, Pa.—*Lancaster Era.*

The Tanner & Delaney Engine Co., Richmond, Va., have made arrangements with the inventor to manufacture Cole's Pole Road Locomotive, illustrated in the AMERICAN MACHINIST last year.

Barney & Kilby, Sandusky, Ohio, have issued a catalogue descriptive of automatic and adjustable cut-off engines built by them, also of vertical marine engines. The catalogue is fully illustrated.

Forbes & Curtis, Bridgeport, Conn., have issued a neatly-printed illustrated catalogue of tools and machines manufactured by them. The list includes pipe-cutting and threading tools and machines, cutting-off machines, etc.

Wm. Lowe, of the Bridgeport Boiler Works, Bridgeport, Conn., has been so busy this year on boiler work and feed-water heaters that inventory had to be put off from June 1st to August 15th. Is still busy, and hopes for a good fall and winter trade.

The United States Electric Lighting Co., capital stock $250,000, has been incorporated in Baltimore by James R. Clark, Charles F. Dieterich, W. Lorman Roberts and others, to manufacture electricity for illuminating purposes, power, etc.—*Baltimore Manufacturers' Record.*

Mr. Wm. E. Harris, superintendent of the Granite Iron Rolling Mill of the St. Louis Stamping Company, will have an exhibition at the exposition within a few days of his improvement in cooling bearings for rollers. The invention will be shown in practical operation on a set of small rolls, driven from the main shafting.

Prof. R. H. Thurston, Director of the Schools of Mechanical Engineering and Mechanics' Arts at Cornell University, Ithaca, N. Y., is desirous of receiving catalogues and price-lists of machinery and materials. He would like, when practicable, two copies; and also, when convenient, samples, models, and enlarged engravings.

A charter was issued at Harrisburg, on the 3d inst., to the Pittsburgh Hob Nail Manufacturing Co.; capital stock, $40,000. The principal office of the company is to be located at Pittsburgh, and the manufactory at Bridgewater, Beaver County. The directors are: James Dickson, Pittsburgh; August Meyer, Bridgewater; J. A. Bockston, Pittsburgh; A. H. Clark, New Brighton; E. W. Swensel, Pittsburgh.—*Industrial World.*

The arms and ammunition factories in New Haven and Bridgeport are fairly active. The Parker Gun Works, in Meriden, are running full time, and the Spencer Gun Co., in Windsor, will start on full time by Oct. 1. The Brown Cotton Gin Company, of New London, reports orders from the South double those of last year. The United States Stamping Company, of Portland, tin goods, is running two hours over.—*Commercial Bulletin.*

The building of the railroad from the 41-mile station on the South Carolina railway, by Eutawville and Elloree to Sumpter, seems now to be an assured success. This will give Sumpter competition to Charleston. We think it will be a matter of only a short time when this line will be pushed on from Sumpter to Bishopville, and then on up Lynche's river into North Carolina. We regard the Eutawville railroad a very important line, and wish it the most abundant success. Work on the road is now being pushed rapidly forward.—*Southern Industrial Record.*

The National Pipe Bending Co., New Haven, Conn., have sold in September one 80-horse heater to Viola Mining Co., Idaho; one 40-horse heater to Vulcan Iron Works, Chicago; one 80-horse heater to Winsted Hosiery Co, Winsted, Conn; one 300-horse heater to Narragansett Electric Light Co. Providence, R. I.; one 60-horse heater to Boston; one 150-horse heater to New York; one 150-horse heater to Grand Rapids, Mich.; one 150-horse heater to Binghampton, N. Y.; one 200-horse heater to Akron Twine and Cordage Co., Akron, Ohio. They have also orders for car bends, ice machine bends, flat coils, and laundry machine coils, that will keep them busy for a month.

The Covered Tube Cable Railway Co., of which A. H. Mathesius, 399 Marcy avenue, Brooklyn, N.Y., is manager, propose to operate the patents granted to Mr. Mathesius, covering very completely the construction and operation of such roads. It is claimed that by their system the cost both of constructing and operating cable roads is greatly reduced, and the most serious objections to such roads overcome. In the system controlled by this company the cable is connected to the grip outside the tube, hence the latter need be only large enough to contain the cable and carrying sheaves. When applying this system on a horse railway already in operation, the cross-ties and rails are used without alteration. A peculiar feature of this system is, that the tube, except immediately under the car, is entirely covered, presenting a smooth appearance, with no opening for snow or dirt. The top of the tube is provided with a movable cover, constructed in halves; as the car moves along one-half of the cover swings to the right, and the other to the left, and in opening removes all obstructions, such as snow or dirt; as the car passes the sections of the cover close by gravity, and, in closing, swing clear of everything. The cover is made of rolled steel, strong enough to withstand any usage it will be likely to get. Another feature of the system is a new design of sheave, calculated to reduce the inevitable loss from slipping of a round rope in a groove, owing to the different diameters with which the rope comes in contact; this slipping not only absorbs a large percentage of the total power required to operate a cable road, but rapidly wears out the sheaves and destroys the cable. All the principal features of this system are new; a model of the system has been constructed: it works with great smoothness, and serves to illustrate the principles involved. We expect, in a few weeks, to be able to present engravings showing the system in detail.

The Niagara Steel Co., of Lockport, N. Y., will erect large mills for the purpose of manufacturing iron and steel.

Franklin Ward, of Rockford, Ill., has purchased land in Lowell, Mass., and will erect a large brick foundry and machine shop.

One of Wheeler's patent surface condensers, a new device, is now on exhibition at the office of the Lighthall Mfg. Co., 97 Liberty street, New York. This improved condenser possesses several new features, prominent among which is the absence of any form of tube packings, whether of paper, wood, or any other material. Plain screw joints only are used, while complete provision for expansion and contraction of the tubes is secured.

The Lake City Tool Co. (windmill manufacturers) Madison, Wis., write us: "The business of this company for the last year has been very good, and the future is so promising that it has increased its capital from $20,000 to $50,000, and it is now engaged in erecting new works of the following dimensions: Machine shop, 44x96; foundry, 40x70; blacksmith shop, 40x25; wood-working shop, 44x96 boiler house, 30x30; paint shop, 30x60. All except paint shop are to be built of stone, in a very substantial manner.

Machinists' Supplies and Iron.

NEW YORK, Sept. 24, 1885.

The condition of the supply business is substantially the same as last reported. In wrought-iron pipe advances have already been made equal to about 10 per cent., with prospects of further advances. In other branches of trade and manufacture there is nothing new to note.

Iron—There has been a slight falling off in the demand for American pig, especially in the line of large orders. There is no indication of over-production, but large buyers are not so urgent, and transactions are in smaller lots than last week; but the offerings have been moderate, indicating that the available stock has been largely absorbed. In prices we quote Standard Lehigh brands at $18 to $18.50 for No. 1 X Foundry; No. 2 X Foundry, $16 to $16.50; Grey Forge, $13.50 to $14.50.

Scotch Pig—Only small transactions are reported in these brands. We quote Shotts, $19.50 to $20; Coltness, $19.50 to $20; Glengarnock, $18 50 to $19; Gartsherrie, $19 to $19.50; Summerlee, $19 to$19.50; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $19.50; Dalmellington, $18 to $18.25.

Lead—Sales of larger lots than for the past three weeks are reported at 4.25c and 4.27½c.; smaller lots have sold at 4 30c

Copper—The demand is moderate, but prices remain reasonably firm Lake has sold at 11¼c. to 11¼c.; other brands 10c. to 10¾c.

Tin—The market is a little easier, owing to a slight decline in London. We quote for jobbing lots of Banca 20 80c.; Straits and Malacca, 20¾c.

Spelter—Refined, 4.75c. to 5c.

Antimony—Hallett's 8 70c.; Cookson's 9.70c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Position wanted as foreman-supt. of works, or draftsman. Address Engineer, AM. MACHINIST.

Engineer, well connected in England and France, would undertake commissions in those countries this winter. Address L., AM. MACHINIST.

Wanted—Position as foreman blacksmith: 23 years' experience on marine work, last 10 years as foreman; best references given. Address P. O. Box 307, Olneyville, R. I.

A practical man desires situation as foreman of a boiler shop; has had experience in marine and stationary work of all kinds. Address "Tubal Cain," AM. MACHINIST.

Wanted—Draftsman of experience; one familiar with engines and mining machinery preferred. Apply by mail, stating age, experience, habits, expected pay, etc. Address "Don," AM. MACHINIST.

Wanted—A practical machinist who has had experience in getting out duplicate work on a piecework system, and who understands the management of help; one having experience on agricultural machinery preferred. Address, with references, Minneapolis Harvester Works, Minneapolis, Minn.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 25 cents per line, each insertion.

Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

Wanted—A new or second-hand horizontal boring and drilling machine. Address V., AM. MACHINIST.

Wanted—A second-hand iron planer, bed and table capacity 4ft.×10ft. Must be cheap. Address Q. D., AM. MACHINIST.

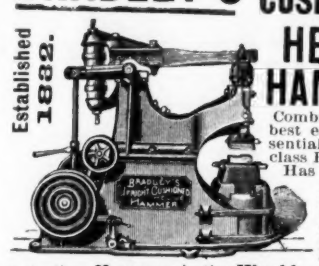
To make room for larger tool, will sell cheap, for cash, a planer 42"x42"x12', in good order. Address P. O. Box 2085, Bridgeport, Conn

Light machinery of all kinds built at short notice. Good workmanship guaranteed. Pennington & Mills, 8 Dey st., Jersey City Heights, N. J.

Cheap for Cash—A 60-inch Newton Half-Automatic Gear Cutter, used one year. Good as new. Also afew other Gear. Cutters, Lathes, Planers and Drills. E. Gould & Eberhardt, Newark, N.J.

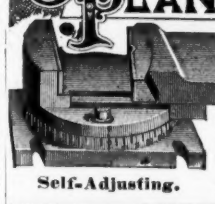
CHANDLER & FARQUHAR,
177 & 179 Washington Street, Boston, Mass.
AGENTS FOR THE
Barnes' Wood and Iron-Working MACHINERY,
Lathes,
SCROLL and CIRCULAR SAWS,
UPRIGHT DRILLS, MORTISERS, &c.
Machines sent on Trial.
Also Dealers in Supplies & Tools for Mechanics & Amateurs.
SEND FOR CATALOGUE B.

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER
Established 1832.

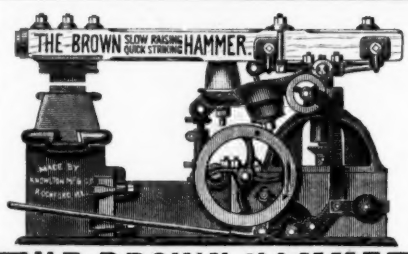


Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.
BRADLEY & CO. Syracuse, N.Y.

STEPHENS PATENT PLANER CHUCKS



Combine valuable features offered by no other tool. In range of opening; advantage of self-adjusting jaw worked by a single screw; graduated base, etc. Parts interchangeable. Chucks guaranteed. Sold by the trade. Send for Catalogue.
Self-Adjusting.
MELVIN STEPHENS, Prop'r, Office, 41 Dey Street, New York.



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STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill

JUST PUBLISHED.
One Volume, Crown, 8vo, 266 pages, 165 illustrations Fine Cloth Binding. $2.50.
MODERN MOULDING & PATTERN-MAKING.
A Practical Treatise upon Pattern-Shop and Foundry Work.
Embracing the Moulding of Pulleys, Spur Gears, Worm Gears, Balance-Wheels, Stationary-Engine and Locomotive Cylinders, Globe Valves, Tool Work, Mining Machinery, Screw Propellers, Pattern-Shop Machinery, and the latest Improvements in English and American Cupolas. Together with a large collection of original and carefully selected Rules and Tables for Every-day Use in the Drawing-office, Pattern-Shop and Foundry.
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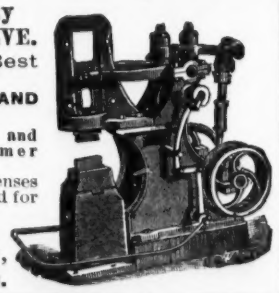
BEAUDRY'S UPRIGHT HAMMER
Has no Shaky WOODEN HELVE.
Springs of Best Rubber.
BLOW, TRUE AND ELASTIC.
Most practical and economical hammer made.
Will reduce expenses of any shop. Send for description.



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BOSTON, MASS.

ANNOUNCEMENT!
We have just issued a new and very complete illustrated catalogue which we will be pleased to mail to our patrons and others on application.
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THE DEANE STEAM PUMP CO.,
HOLYOKE, MASS.,
NEW YORK, BOSTON, CHICAGO, PHILADELPHIA AND ST. LOUIS.
Send for New Illustrated Catalogue, No. 18.

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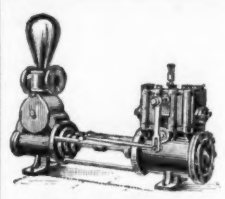

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THE M. T. DAVIDSON IMPROVED STEAM PUMP
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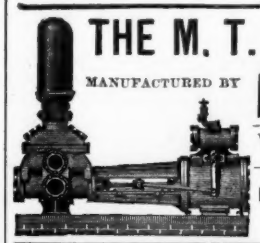
DAVIDSON STEAM PUMP COMPANY.



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251 *pages*, 6 *plates*, 58 *illustrations*, 8 *vo*, *cloth*. $5.00.
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WITH SPECIAL CONSIDERATION OF THE
LINK-MOTIONS OF LOCOMOTIVE ENGINES,
BY DR. GUSTAV ZEUNER.
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BY PROF. J. F. KLEIN.
E. & F. N. SPON, 35 Murray St., New York.

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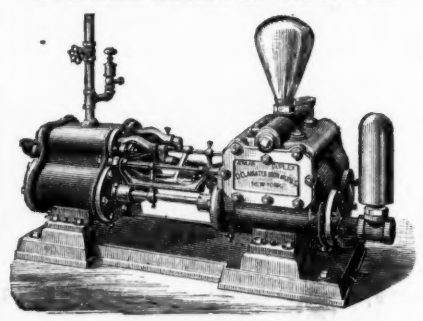

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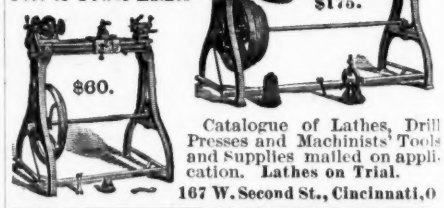

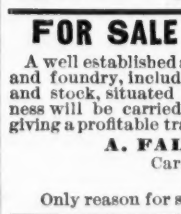

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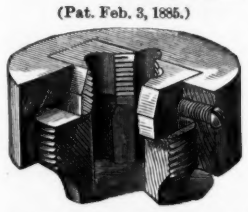

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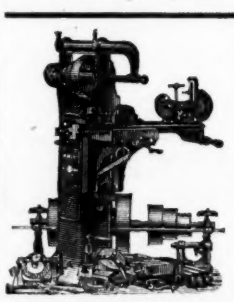

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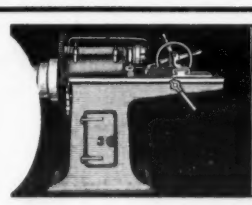

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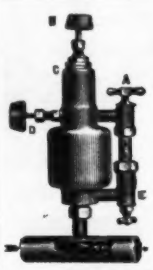

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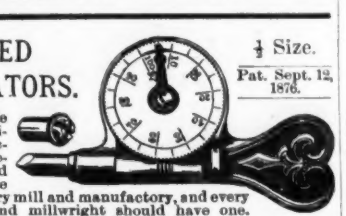

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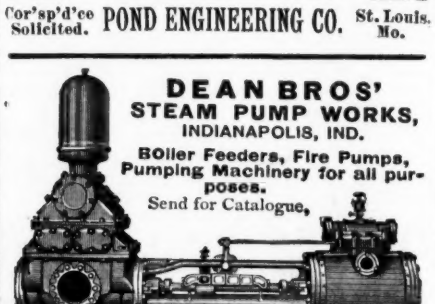

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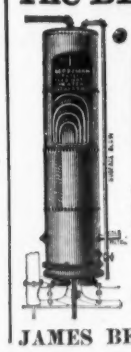

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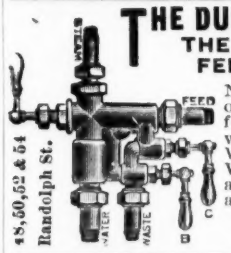

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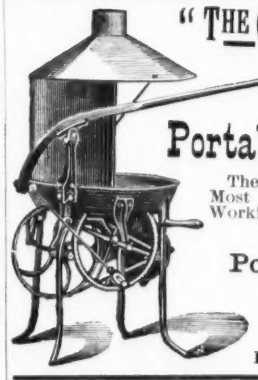

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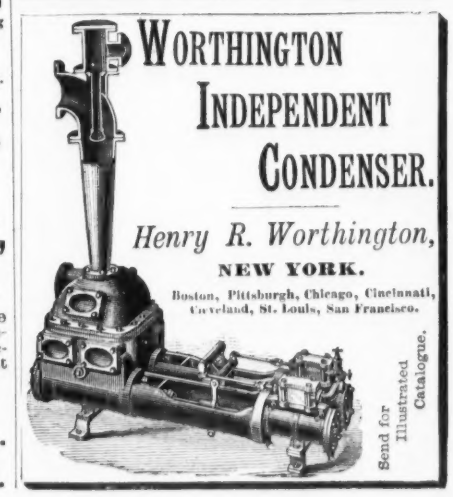

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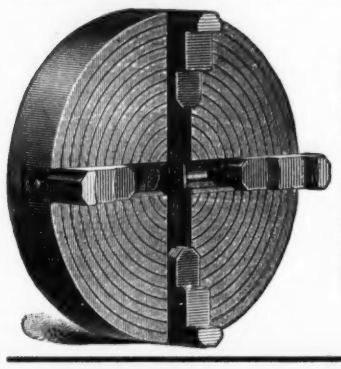

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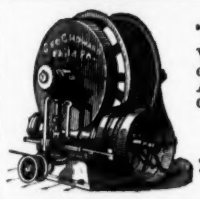

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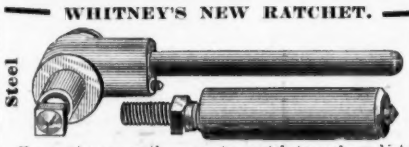

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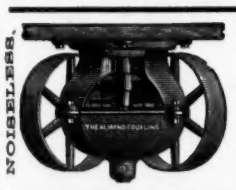

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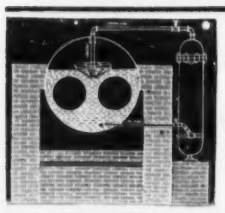

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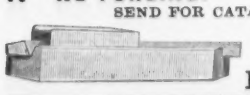

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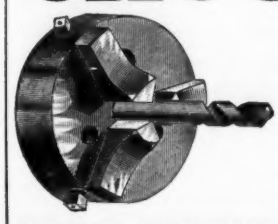

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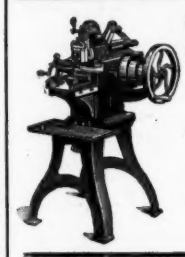

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NOTICE.

Week before last we published, under this heading, references to a small portion of the practical articles that have been specially prepared for the American Machinist, and have appeared in our columns during the last few months. Last week we published an additional list. We append another list below. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

J. C. Hoadley.

Unbalanced Bodies in Revolution. March 14, 1885
Diagram Showing the Inertia of the Reciprocating Parts of the Steam Engine. June 7, 1884
Inertia of the Reciprocating Parts of the Steam Engine. June 7, 1884; September 13, 1884

J. D. Campbell.

Fitting and Care of Axle Boxes. August 3, 1884
Draft Regulating Appliances. March 15, 29; April 12, 26, 1884
Fitting Locomotive Wedges. August 16, 1884
Driving Boxes and Wedges. September 27, 1884
Building Locomotives in Repair Shops. February 9, 1884
Locomotive Draft Appliances. April 25, 1885.

Robert E. Masters.

Moulding Ammonia Boilers. November 15, 22, 1884
Cutting Down the Face of Gear Wheels in the Mould. October 25, 1884
Moulding Balance Wheels. August 2, 1884
Portable Cupola. December 13, 1884
Cupola Management. May 17, 1884
Melting in a Southern Foundry. April 12, 1884
Melting Small Quantities of Iron. June 14, 1884
Melting Steel in an Ordinary Cupola. August 23, 1884.
Casting Rolls with Shaft in Them. May 9, 1885.
Economy in Using Small Cupolas. May 16, 1885.
Steel Castings. Aug 15, 1885.
Casting Steel in an Ordinary Cupola and Publishing the Process. July 25, 1885.

Jas. F. Hobart.

Selecting and Using Files. January 10, 1885
Hammer and Grindstone January 17, 1885
Emery Grinding. January 24, 1885
Forge, Anvil and Lathe. February 28, 1885.
Grinding and Using Cutting Tools. April 18, 1885
Doing Jobs on Sunday. May 30, 1885
Examination of Stationary Engineers. August 22, 1885
Engineers' Societies—Small Things—Babbitting Boxes—That Hog-nose Drill. August 1, 1885
Against Sunday Work. July 18, 1885

Angus Sinclair.

Chicago Limited Express. January 5, 1884
Fuel Economy with Locomotives. July 5, 1884
Locomotive Engine Running. February 9, 23; March 8, 22; April 5, 19; May 3, 17; June 7; August 16; November 1, 1884
Locomotive Economy. January 17, 1885
American Locomotives Built in 1884. January 24, 1885
Railroad Snow Plowing. January 19, 1884
How the Fastest Train in America is Run, January 5, 1884
Work of Pulling a Heavy Freight Train. November 22, 1884
Water for Locomotive Boilers. September 20, 27, 1884.
Efficiency of Brakes. January 10, 1885

Harris Tabor.

High Efficiency of Locomotives. February 14, 1885
Centrifugal Force in Revolving Bodies. April 4, 1885

Prof. Jno. E. Sweet.

Point of Cut-Off in a Locomotive Engine. November 15, 1884
Examples of Close Measurements Under Difficulties. February 16, 1884
The Perfect Screw Problem. July 19, August 3, 1884
Proportioning Slide Valves and Determining the Effect of Different Proportions. August 16, August 30; September 6, 27; October 4, 11, 1884

A. J. Stevens, Gen. M. M., C. P. R. R.

Performance of a Locomotive. February 2, 1884
Correction of Boiler Criticism. January 3, 1885
Indicator Diagrams from the Largest Locomotive in the World. January 10, 1885
Improved Draft Pipe. May 16, 1885
Utilizing Steel and Iron Machine Shop Scrap. June 6, 1885
Deep Well Pump on the C. P. R. R. June 27, 1885

Chas. T. Porter.

The Bursting Strain in Revolving Wheels. February 16, 23, 1884
What Is Centrifugal Force? April 12, 1884

Theo. N. Ely, Genl. Supt. Motive Power Penn. R. R.

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J. G. A. Meyer.

Laying Out Link Motion. May 10, 17, 24, 31, 1884
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Balancing Locomotive Wheels. April 12, 1884
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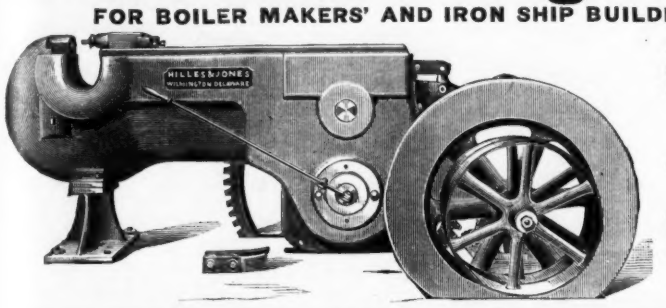

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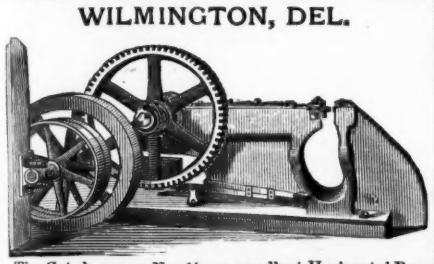

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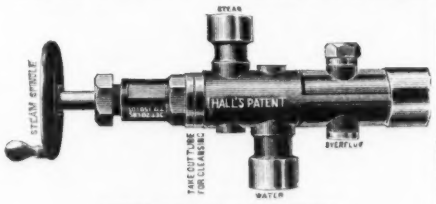

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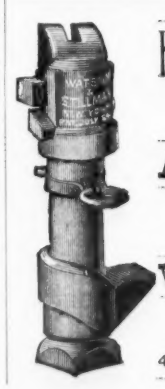

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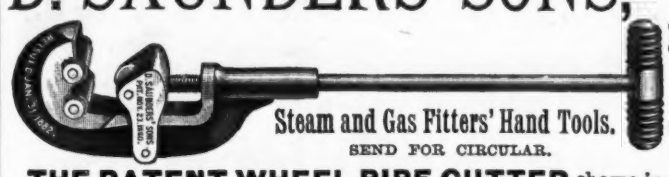

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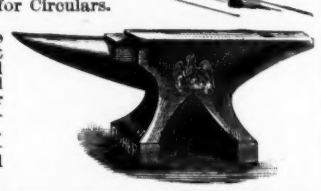

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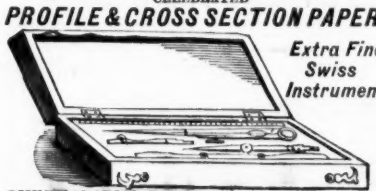

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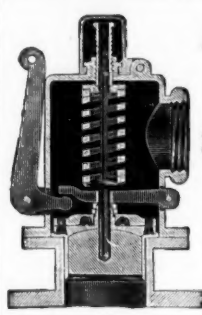

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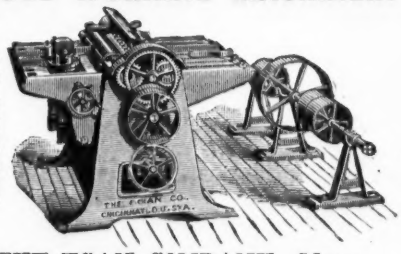

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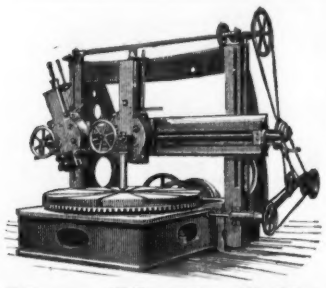

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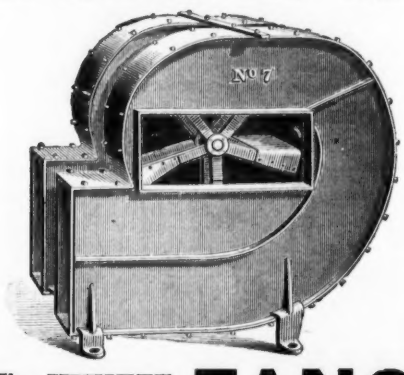

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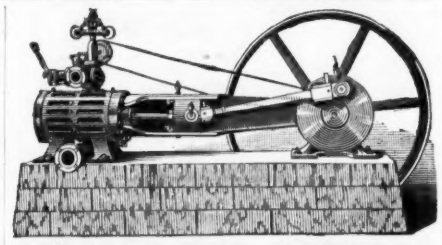

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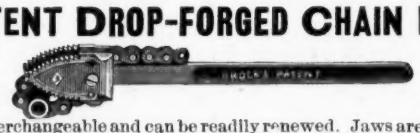

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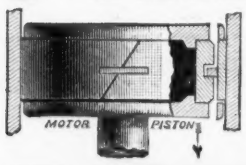

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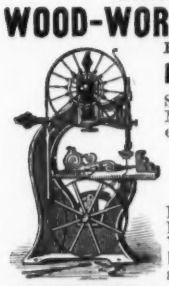

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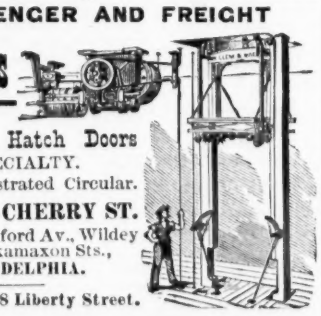

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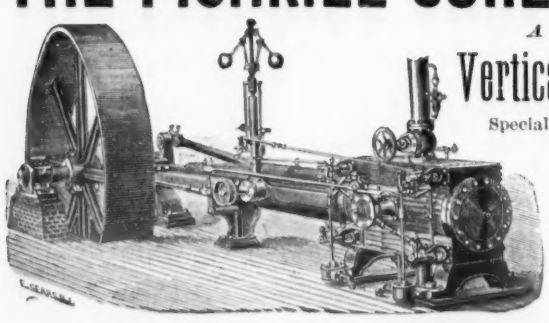

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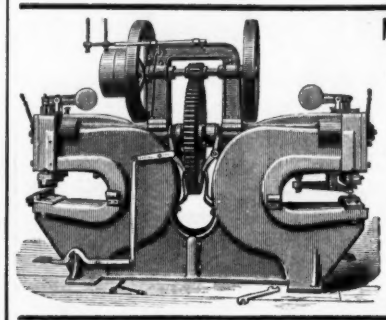

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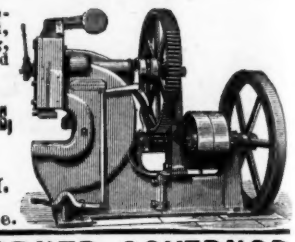

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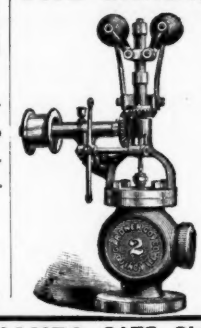

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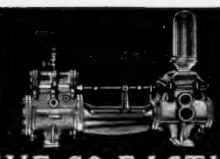

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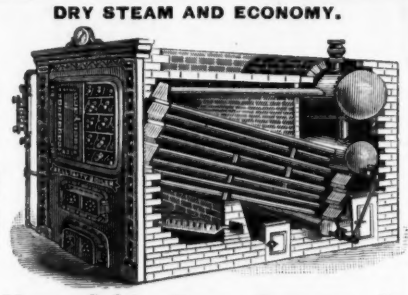

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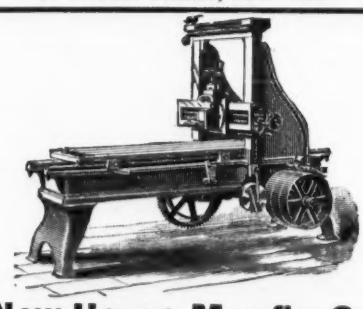

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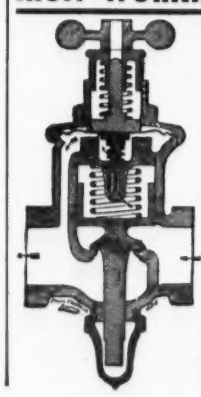

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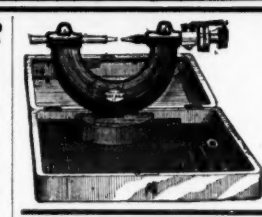

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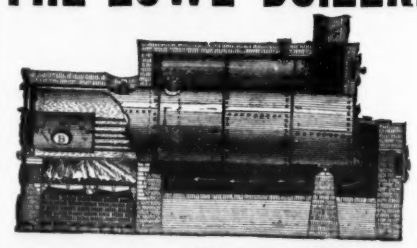

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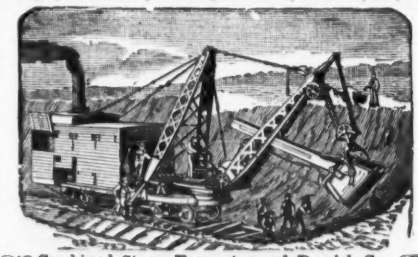

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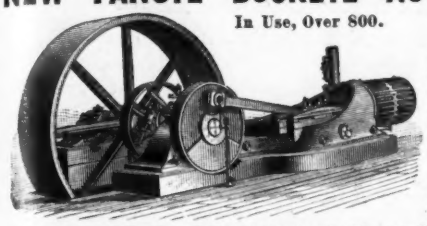

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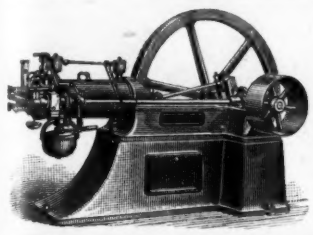

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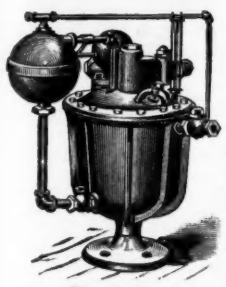

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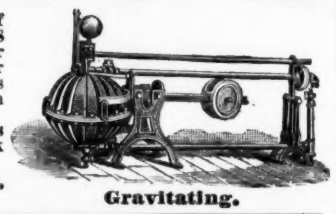

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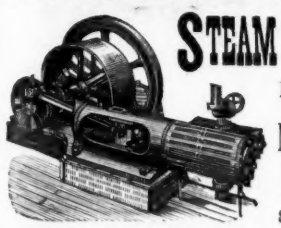

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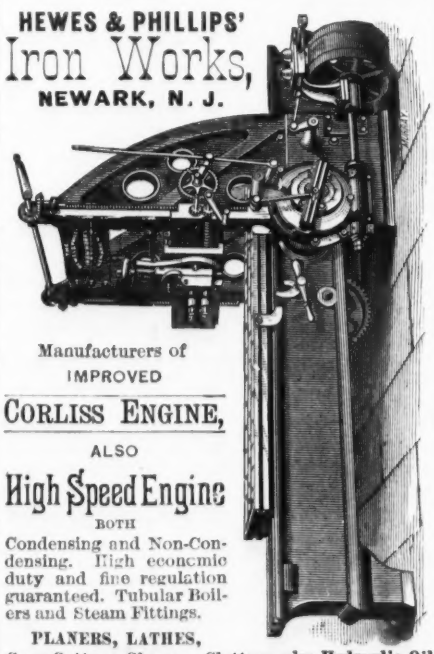

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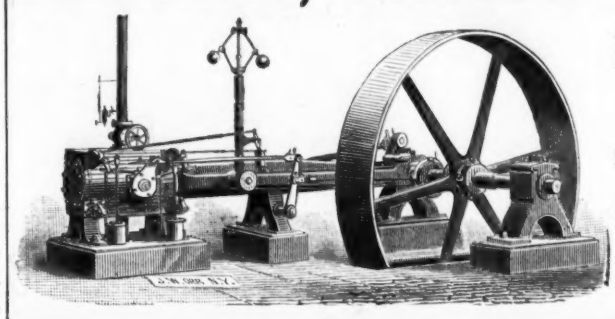

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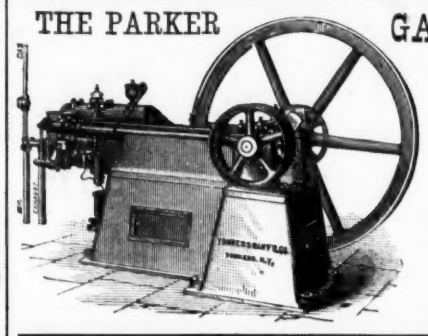

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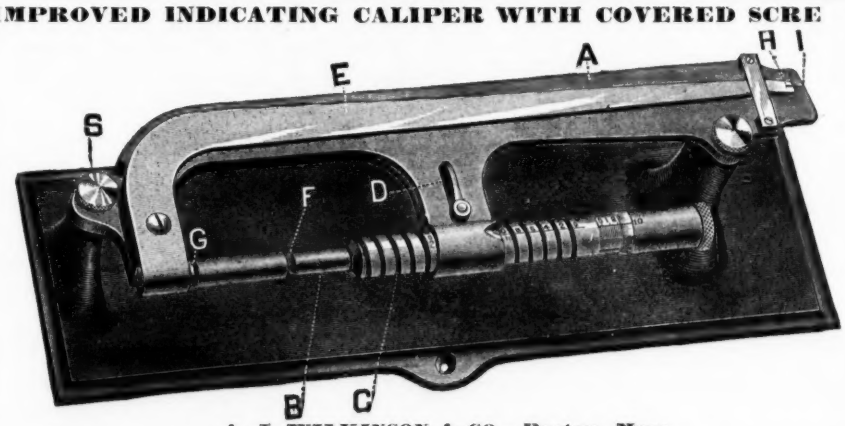

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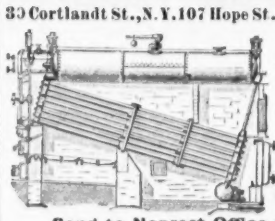

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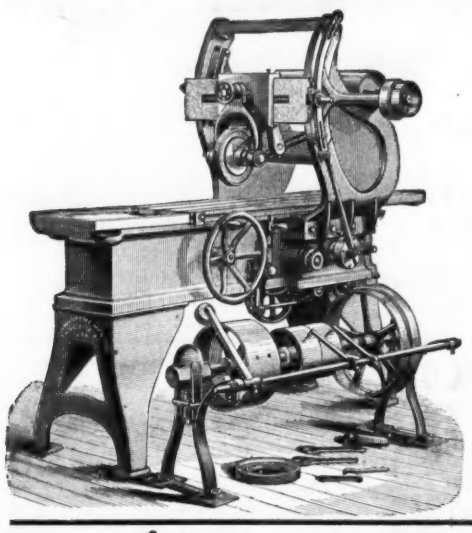

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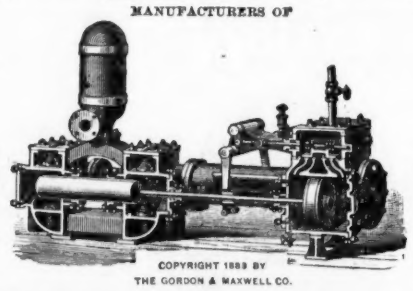

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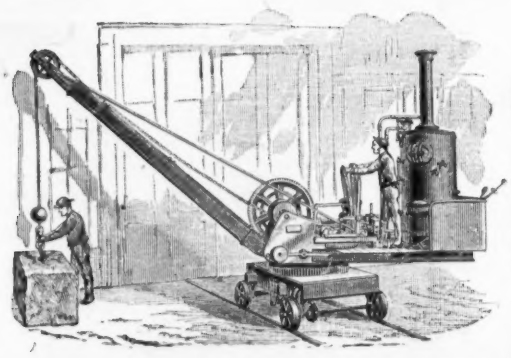

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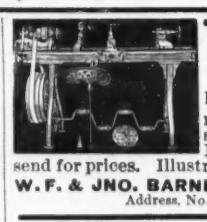

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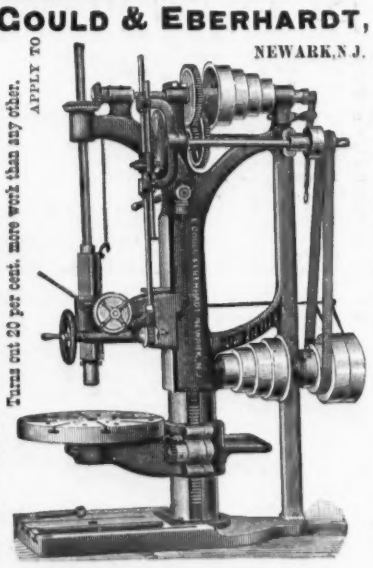

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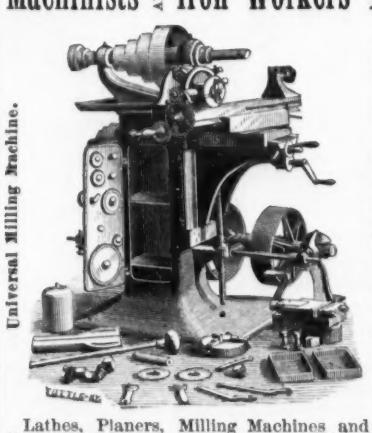

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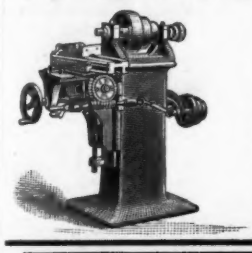

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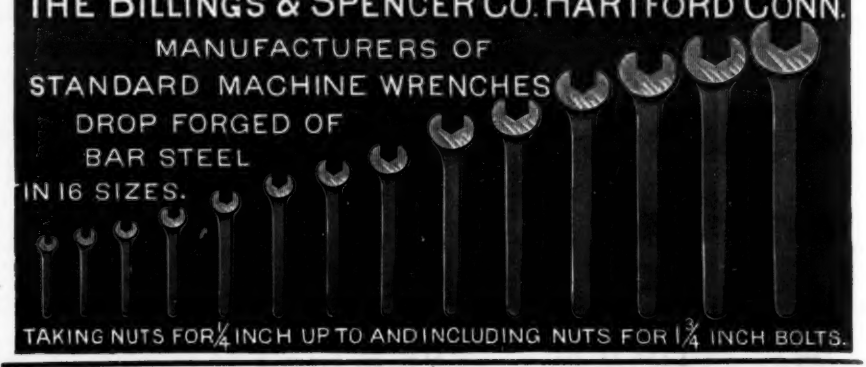

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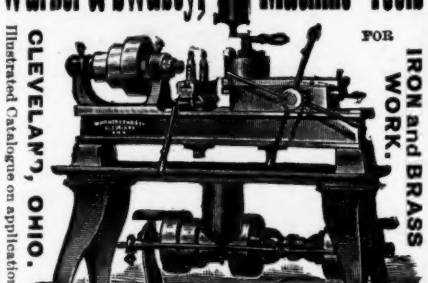

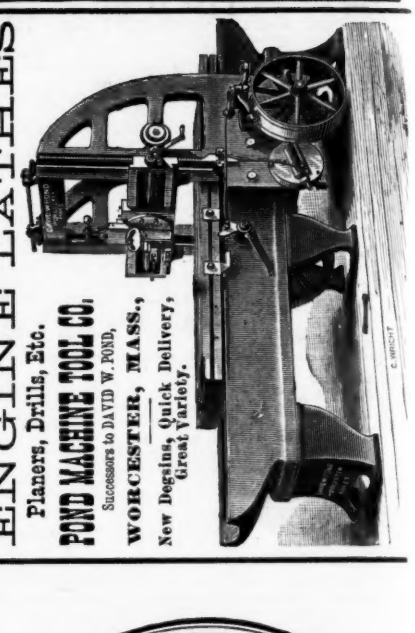

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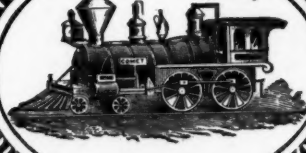

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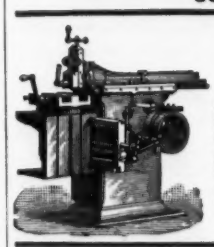

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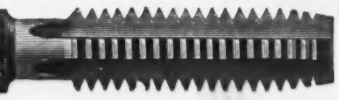

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